Department of the Army

Program Manager for

Chemical Demilitarization

Aberdeen Proving Ground, Maryland

Chemical Stockpile Disposal Project

Programmatic Process
Functional Analysis Workbook (FAWB)

Book 25

Deactivation Furnace System

DFS

Revision 1*, Change 4*

January 7, 2004

NOTE: The DFS programmatic process FAWB applies to ANCDF, PBCDF, TOCDF and UMCDF.

ALL FAWB SYSTEMS

Book (Chapter[1])	System Identifier	FAWB Title
UTILITY SYSTEMS (Site-specific)		
1 (5.15)	NGLPG	Fuel Gas System (Natural Gas and Liquefied Petroleum Gas)
2 (5.14)	HYPU	Hydraulic Power Unit and Distribution System
3 (5.19)	BCS	Bulk Chemical Storage System
4 (5.16)	CAS	Compressed Air Systems (Plant, Instrument, and Life Support)
5 (5.22)	SGS	Steam Generation System
6 (5.26)	DMS	Door Monitoring System
7 (5.28)	PCS	Primary Cooling Systems
8 (5.12)	EPS	Electrical Distribution and Emergency Power System
9 (5.13)	—	(HVAC FAWB moved to Book 20 (Process Systems))
10 (5.17)	WATER	Water Systems (Process Water, Potable Water, and Water Treatment Systems)
11 (5.21)	CDSS	Central Decon Supply System
12 (5.18)	TSHS	Toxic Storage and Handling Systems (Agent Collection, Spent Decon, and Sumps)
13 (5.20)	ACSWS	Acid and Caustic Storage and Wash System (DELETED[2])
14 (5.27)	FDSS	Fire Detection and Suppression System
15 -19	—	(not assigned; reserved for future use)
PROCESS SYSTEMS (Programmatic)		
20	HVAC	Heating, Ventilation, and Air Conditioning System
21	RHS	Rocket Handling System
22	PHS	Projectile Handling System
23	MHS	Mine Handling System
24	BCHS	Bulk Container Handling System
25	DFS	Deactivation Furnace System
26	LIC	Liquid Incineration System
27	MPF	Metal Parts Furnace System
28[3]	PAS/PFS	DFS, LIC, and MPF Pollution Abatement System and PAS Filter System
29	BRA	Brine Reduction Area and BRA PAS
30	CHB	Container Handling Building
31	ACAMS	Automatic Continuous Air Monitoring System
32	TCE	Treaty Compliance Equipment
33[4]	DUN	Dunnage Incineration System and DUN PAS

[1] TOCDF has original "chapter" numbers for utility system FAWBs.

[2] The ACSWS FAWB was deleted.

[3] The PAS and PFS draft FAWBs were combined into a single PAS/PFS FAWB (Book 28).

[4] A DUN FAWB is not being developed per direction of PMCSD on 9-10-98.

CONTENTS

CONTENTS (cont'd)

CONTENTS (cont'd)

TABLES

REVISION LOG

REV.#	PAGE(S)	REFERENCE AND DESCRIPTION OF CHANGE
0	NA	Initial Issue
1	*1-1, B-1, C-1,2*	*Updated to reflect current status of demil program and programmatic process FAWBs.*
	2-3	*ECPs PBAP1111DFS & UMSF0951DFS – DFS Cyclone Discharge*
	2-4, Sect.3, 4-3, Apps B,D,F,G,H	*Updated to reflect current source documentation (e.g., P&IDs, PLC code, and SOPs).*
	3-3,12,13,18, B-2,4,5, C-3÷8, H-1	*Modified based on discussions at the Jan 2001 ANCDF DFS review meeting.*
	3-2,10,11,16, B-4	*ECP TEMP-2540-DFS R1 – DFS Temperature Control Loop Modification*
	3-3, B-4, F-2	*ECP TEMP-2570-DFS – DFS Kiln Pressure Wide Range Pressure Transmitter*
	3-4,12,18, C-19, D-26, F-1,2,3	*ECP TEMP-2559-DFS – DFS Kiln Automatic Isolation Valve*
	3-4	*ECPs ANAP747SRL & PBAC669SRL – RFIs 36th Set- Misc. RFIs*
	3-5	*ECP TEMP-2678-RSM – RSM-102/DFS-GATE-102*
	3-6, B-2	*ECP TEMP-2625-DFS R1 – DFS Upper Gate Spray Modification*
	3-6, B-5	*ECP TEMP-2579-DFS – DFS Feed Chute Improvement*
	3-8, D-6,7	*ECP TEMP-2609-DFS – DFS HDC Low Low Temperature, 16-TALL-042/184*
	3-8, H-1	*ANCDF HDC O&M Manual.*
	3-15,16, B-5, D-23÷26, F-1,2,6	*ECP TEMP-2561-DFS – DFS ST Overhead Thermal Insertion Flowmeter (DFS PAS V-Cone Flow Element)*
	3-16, D-26	*ECP TEMP-2494-DFS – DFS AFB 1400 Degree Purge Bypass*
	4-3,4	*ECP PBAP-836-MDB – Power source correction for DFS-CRAN-401.*
	Appendix A	*Updated with latest comprehensive acronym list.*
	B-1	*ECP PBAC1000DUN – DUN & DUN PAS Deletion & Sec Waste Processing*
	B-2	*ECP TEMP-2670-DFS – DFS Upper Feed Chute Spray, Slide Gate Wiper, and Misc. Parts Conveyor Feed Chute Modifications.*
	B-3	*ECP UMSF0699DFS – Nozzle to Wash Feed Chute Flapper Gates*
	Appendix C	*Created new site-specific A&I matrices for ANCDF, PBCDF and UMCDF based on latest source documentation, site-specific input, and ECPs UMAP815DFS/UMUF872DFS for UMCDF RCRA/MACT AWFCOs.*
	C-15	*ECP TEMP-2679-DFS – DFS Raise Kiln Hi-Hi Temp Alarm (16-TAHH-020) Set Point*
	C-16	*ECP TEMP-2610-DFS – DFS Eliminate Operator Nuisance Alarms*
	C-16,17	*ECP TEMP-2624-DFS – DFS HDC Low Low Temperature AWFCO conveyor in manual*
	C-19	*ECP TEMP-2519-DFS R1 – DFS PLC Modification for Calculating the Agent Feed Rate*
	Appendix E	*Added all ANCDF screens and TOCDF screens for Stop Feed and RCRA alarms, and DFS Overview*
1 CH1	*Appendix C*	*Inserted revised UMCDF DFS A&I matrix per ECP UMSF1128DFS.*

REVISION LOG (CONT'D)

REV.#	PAGE(S)	REFERENCE AND DESCRIPTION OF CHANGE
1 CH 2	*C –3-8*	*Westinghouse Anniston Letter WSN-96-007830 – ANCDF Review of A&I Matrices for the MPF, MPF PAS, DFS, DFS PAS, LIC, and LIC PAS.*
	C –3-8	*Westinghouse Anniston Letter WSN-96-008537 – ANCDF Review of A&I Matrices for the DFS and DFS PAS per ECP-0992.*
	3-2, B-2	*Westinghouse Anniston Letter WSN-96-8776 – ANCDF Review of FAWB 25, DFS and ECP ANWP1648PLC – Software Chg for Furn Temp on DFS.*
1 CH 3	*C-3 thru C-8*	*Westinghouse Anniston Document Change Proposal #AN-04-011 – DFS – Corrected A&I Matrixes to Reflect the As-Built and Tested Conditions.*
	C-5,6,8	*Westinghouse Anniston Document Change Proposal #AN-04-027 – Modification to the DFS FAWB Book 25 A&I Matrix under AN-1069-ECP.*
1 CH 4	*C-5*	*Westinghouse Anniston Document Change Proposal #AN-04-052 – Modification to the DFS FAWB Book 25 A&I Matrix under AN-1203-ECP.*

SECTION 1
INTRODUCTION

1.1   CSD PROJECT BASELINE TECHNOLOGY OVERVIEW

The Office of the Project Manager for Chemical Stockpile Disposal (PMCSD) is responsible for the disposal of the United States' existing unitary chemical weapon stockpile. PMCSD manages execution of the design, construction, equipment acquisition/installation, systemization, plant operations, and closure of all CSD project sites.

The CSD project baseline technology consists of the following:

- mechanical disassembly or puncturing the munitions to remove chemical agent and any explosives or propellant,

- incineration of the chemical agent and any explosives and propellant, and

- thermal detoxification of metal parts and any contaminated dunnage.

This technology was demonstrated during a series of operational verification testing (OVT) campaigns at the Johnston Atoll Chemical Agent Disposal System (JACADS). JACADS represent*ed* the first generation of a full-scale facility implementation of the project baseline technology. JACADS *completed disposal* of the chemical agent and munitions stockpiled at Johnston Atoll *in November 2000.*

The second generation plants implementing the baseline technology include the following:

- Tooele Chemical Agent Disposal Facility (TOCDF), located at the Deseret Chemical Depot in Tooele, Utah;

- Anniston Chemical Agent Disposal Facility (ANCDF), located at the Anniston Army Depot near Anniston, Alabama;

- Umatilla Chemical Agent Disposal Facility (UMCDF), located at the Umatilla Chemical Depot near Hermiston, Oregon; and,

- Pine Bluff Chemical Agent Disposal Facility (PBCDF), located at the Pine Bluff Arsenal near Pine Bluff, Arkansas.

Unless otherwise noted, the programmatic functional analysis workbooks (FAWBs) for process systems apply to each of these CSD sites.

1.2   BACKGROUND

FAWBs for 25 plant systems were issued for JACADS in January 1985 by The Ralph M. Parsons Company (now the Parsons Infrastructure & Technology Group, Inc.). Parsons is the Design and Systems Integration Contractor (DSIC) for the CSD project. The FAWBs provided the basis for the facility control system's programmable logic

controller (PLC) and computer systems programming. The JACADS FAWBs were later revised by United Engineers & Constructors and, by the July 1989 issue, two additional systems had been added.

FAWBs for TOCDF were issued in April 1993 by Parsons. There were 28 plant systems defined for TOCDF; however, only 27 FAWBs were issued (The Residue Handling Area FAWB was not issued). Most of the TOCDF plant systems were the same as those for JACADS; however, there were some differences due to different plant configurations, system consolidations, and the inclusion of additional systems. The TOCDF systems contractor (SC) received the FAWBs and assumed responsibility for maintaining the set current with the TOCDF plant configuration and the evolution of its operational strategy. Utility system FAWBs also were developed for ANCDF, PBCDF and UMCDF. Their purpose is to assist the sites during utility systems equipment procurement, and to describe their use in facility operation. Utility system FAWBs are more site-specific, consist primarily of SC-procured equipment, and will be maintained by the individual demilitarization sites.

In September 1997, PMCSD began the development of programmatic process FAWBs for process systems common to all sites, eliminating the need to maintain separate process FAWBs at each site. Having a single set of process FAWBs provides a means to ensure operational consistency between the sites and to accurately record differences between the demil facilities. The programmatic process FAWBs serve as an invaluable training tool for the Systems Contractor for Training (SCT) to ensure consistent training on process systems for all sites, and to quickly identify site-specific training requirements.

1.3   PROGRAMMATIC PROCESS FAWB SYSTEMS

Sixteen process systems having minimal differences between sites were designated as programmatic systems. These programmatic process FAWBs are maintained as a single reference rather than at each site. Minor site configuration differences between the sites are highlighted in the FAWB discussions and tables. Fourteen of these 16 systems were included in the 28 original plant system FAWBs developed by the DSIC. For conciseness, the dunnage incinerator (DUN) and DUN pollution abatement system (PAS) FAWBs were to be combined into a single FAWB, for a total of 15 programmatic process FAWBs. However, development of a programmatic FAWB for the DUN and DUN PAS was suspended indefinitely at the direction of the PMCSD Operations Team (see FAWB Note B-1). In addition, FAWBs for the wet PAS and the PAS filter system (PFS) were combined into a single FAWB (see FAWB Note B-2). Therefore, a total of 13 programmatic FAWBs were developed for the process systems. The heating, ventilating, and air-conditioning (HVAC) FAWB originally was included as one of the utility system FAWBs produced for ANCDF in 1996 (HVAC FAWB was Book 9 for ANCDF Utility FAWBs). It has been recategorized as a process system and is included in the set of programmatic process FAWBs.

The programmatic process FAWBs are numbered in accordance with the convention established during production of the ANCDF and UMCDF utility system FAWBs. This convention reserves book numbers 1 through 19 for utility systems, and book numbers 20 through 34 for the process FAWBs. Programmatic process FAWB book numbers and

titles are listed in Table 1.1. The original TOCDF FAWB chapter numbers are shown for reference.

Twelve of the 28 original plant system FAWBs are designated as site-specific utility systems. For these systems, the SC is delivered an initial utility FAWB indicating the system design configuration and operational strategy. The SC maintains the utility FAWBs to reflect the site-specific configuration. The utility FAWBs are listed in Table 1.2; original TOCDF FAWB chapter numbers are shown for reference.

The two remaining systems of the 28 originally planned plant system FAWBs are the acid and caustic storage and wash system (ACSWS) (5.20) and the residue handling area (5.24). The ACSWS FAWB at TOCDF no longer is maintained and has not been developed for follow-on sites (see FAWB Note B-3). A FAWB for the residue handling area was not produced due to its lack of automatic control features.

Table 1.1   Programmatic Process FAWBs

FAWB Book #	FAWB Title (TOCDF FAWB Chapter #)
20	Munitions Demilitarization Building HVAC (5.13)
21	Rocket Handling System (5.1)
22	Projectile Handling System (5.2)
23	Mine Handling System (5.3)
24	Bulk Container Handling System (5.4)
25	Deactivation Furnace System (DFS) (5.5)
26	Liquid Incinerator (LIC) System (5.6)
27	Metal Parts Furnace (MPF) System (5.7)
28[1]	DFS, LIC, and MPF Pollution Abatement System and PAS Filter System (5.9)
29	Brine Reduction Area (BRA) and BRA PAS (5.23)
30	Container Handling Building (5.11)
31	Automatic Continuous Air Monitoring System (5.25)
32	Treaty Compliance Equipment (Not included in original FAWB)
33[2]	DUN System and DUN PAS (5.8 & 5.10)

[1] Per discussions held during the comment resolution matrix meeting for the PAS FAWB on 11-10-98, the draft programmatic process FAWBs for the PAS and PFS were combined into a single PAS/PFS FAWB, Book 28 (See FAWB Note B-2).

[2] As directed at the FAWB teleconference on 9-10-98, a programmatic process FAWB for the DUN/DUN PAS is not being developed (See FAWB Note B-1).

Table 1.2   Site-Specific Utility FAWBs

FAWB Book #	FAWB Title (TOCDF FAWB Chapter #)
1	Fuel Gas System (5.15)
2	Hydraulic Power Unit and Distribution System (5.14)
3	Bulk Chemical Storage System (5.19)
4	Compressed Air Systems (5.16)
5	Steam Generation System (5.22)
6	Door Monitoring System (5.26)
7	Primary Cooling System (5.28)
8	Electrical Distribution & Emergency Power System (5.12)
9	Not used; formerly HVAC
10	Water Systems (5.17)
11	Central Decon Supply System (5.21)
12	Toxic Storage and Handling Systems (5.18)
13	Not used; formerly acid and caustic storage and wash system
14	Fire Detection and Protection System (5.27)
15 - 19	Not assigned; reserved for future use

1.4   PROGRAMMATIC PROCESS FAWB PURPOSE

The programmatic process FAWBs serve as a repository for all control information for the automated aspects of the baseline technology demilitarization process systems. They serve as one of the source documents for PLC control system and computer system programming, operator training, and facility operation. These FAWBs also serve as programmatic reference documents that define how the process systems operate and capture the differences between facility operational configurations. Each programmatic process FAWB contains a subsection that defines the system boundaries and identifies the interfaces with other plant process and utility systems.

Programmatic process FAWBs are living documents, subject to configuration control under the CSD project Participant Quality Assurance Plan. They are meant to be continuously updated with user input whenever system modifications are made, or as needed to enhance the information presented. Programmatic process FAWB revisions are implemented as outlined in Section 1.6. The process by which the SCT maintains the programmatic process FAWBs and the roles and responsibilities of each organization affiliated with the CSD project are described in detail in the Programmatic Process FAWB Maintenance Plan.

Programmatic Process FAWB Limitations

Even though the FAWBs contain detailed descriptions of the configuration and control for each process system, they are not all-inclusive. Every effort is made to include the

level of detail necessary to fully describe the specific operating configuration for each process system. Each process FAWB includes supporting references to direct the user to relevant programmatic and site-specific documentation (e.g., standing operating procedures, drawings).

Because of the revision cycle time, there will be a slight lag time between recent changes and their reflection in the FAWB. Maintenance of the FAWBs will be done semiannually, or more frequently if needed, to reflect significant modifications.

The FAWB maintenance program relies heavily on input from each baseline technology demilitarization site. Timely and accurate input ensures that the FAWBs reflect the current configuration at each of the sites. All information received will be thoroughly reviewed to ensure consistent and accurate documentation.

As a programmatic document, the FAWBs describe the configuration and operation of four separate facilities. Care must be taken by the user to ensure that the information extracted from this document reflects the configuration for the facility of interest. Site-specific differences are highlighted in both the text and the appendices to avoid confusion.

1.5   PROGRAMMATIC PROCESS FAWB ORGANIZATION

The process FAWBs document the chemical demilitarization facility operations at ANCDF, PBCDF, TOCDF, and UMCDF. The format and structure of the programmatic process FAWBs differ from the original format prepared by the DSIC, and from the format previously maintained at TOCDF. The information from earlier versions has been retained and updated to reflect lessons learned from the design, construction, systemization, and operation of the demilitarization facilities, including JACADS and the Chemical Agent Munition Disposal System (CAMDS). The overall layout of the programmatic process FAWBs is shown in Table 1-3.

1.6   PROGRAMMATIC PROCESS FAWB REVISIONS

The programmatic process FAWBs are maintained by the SCT to reflect the operational and control system configuration at each CSD site that implements the baseline destruction technology. Each programmatic process FAWB will be reviewed and revised, as required, on a semiannual basis. Individual process FAWBs can be revised more frequently, if needed, to reflect significant configuration changes. Programmatic process FAWB modifications can be generated by the following:

- Engineering change proposals at any of the CSD sites

- CSD project programmatic lessons learned

- Operational modifications that do not involve configuration changes

- Programmatic changes

- Need for greater detail or clarification

The programmatic process FAWB maintenance plan identifies the organizations that participate in the FAWB maintenance program and the responsibilities of each to supply information that could result in revisions to the FAWB. All organizations are represented

on the FAWB Evolvement/Evaluation Team (FEET), and are involved with review of each FAWB revision to ensure that the site configuration and operating strategy is current.

Table 1.3   Organization of the Programmatic Process FAWBs

Section	Title	Contents
1	Introduction	General FAWB background, organization, and revision method
2	System Overview	Purpose of the system; operational and process design basis summary; system boundaries and interfaces
3	Process Description	Description of subsystems; control sequences
4	Component Summary	Tables listing parameters for primary components; power source listings
App. A	Acronyms and Abbreviations	
App. B	FAWB Notes	Notes that provide additional detail or background information
App. C	Alarm and Interlock Matrices	Programmatic matrices or matrices for each site
App. D	PLC Automatic Control Sequences	Automatic logic contained in the PLC code; burner management system automatic controls; sequencer logic for demil systems
App. E	Operator Screens	Advisor PC screens for each site
App. F	Instrument Ranges	Tables showing instrument ranges and setpoints
App. G	Intercontroller Communications	Tables listing the digital intercontroller inputs/outputs (DICIs/DICOs)
App. H	References	Listing of reference documents, including drawings, used to prepare and maintain the FAWB

SECTION 2
SYSTEM OVERVIEW

2.1 PURPOSE AND FUNCTION

The deactivation furnace system (DFS) incinerates residual chemical agent [1] (GB or VX) and deactivates energetics separated from demilitarized munitions. Components processed by the DFS include sheared rockets, land mines, and energetics removed from projectiles (i.e., bursters, propellants, booster charges, fuzes). The furnace feedstock also includes fiberglass and fiberglass resin from processed rockets that were packed in fiberglass tubes with aluminum end caps. At any given time, the DFS processes components from only a single, munition type and a single agent such as drained M55 rockets containing residual GB or VX, or whole, drained M23 land mines containing residual VX.

The DFS consists of a rotary kiln, a heated discharge conveyor (HDC), a blast load attenuation duct (BLAD), a cyclone, an afterburner, and associated subsystems.

The rotary kiln thermally deactivates and incinerates energetics, and *volatilizes and partially combusts* residual agent and other organic materials. The kiln is a countercurrent furnace in which munitions travel in the opposite direction of the exhaust gas stream. Since the kiln processes energetics that could result in a small detonation, the exhaust duct leading from the kiln is equipped with a BLAD to prevent a blast shock wave from reaching the DFS pollution abatement system (PAS). *Exhaust gasses* flow from the BLAD to the cyclone, where large particulates are separated from the gas stream. Then, the gasses flow to the afterburner where they are heated to ensure complete combustion of any residual, gaseous, organic materials. Exhaust gases from the afterburner flow to the PAS for final cleansing prior to discharge to the atmosphere or for additional treatment in the PAS filter system (PFS) [2]. An induced draft (ID) fan that is part of the PAS at TOCDF, and part of the PAS/PFS at the follow-on sites supplies draft for the DFS.

Scrap metal and ash from the furnace are transferred to the HDC. The HDC provides additional residence time at elevated temperatures, ensuring complete destruction of any remaining organic materials. Then, it discharges solid waste products through a chute into a portable waste bin located in the HDC blast enclosure outside the DFS room wall. Rocket tracking software provides DFS operational and waste bin filling information.

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[1] *HD, HT, and/or H may also be incinerated in the DFS when processing agent-contaminated components from leaker projectiles and mortars.*

[2] The PFS is part of the designs at ANCDF, PBCDF, and UMCDF only. TOCDF does not, and will, not have a PFS (See FAWB Note B-4).

2.2   OPERATIONAL SUMMARY

DFS feed comes from two explosive containment rooms (ECRs) in which various munition processing activities take place. Rocket pieces, land mines, bursters, propellants, booster charges, and fuzes are gravity fed from each ECR through a feed chute. Each feed chute has a built-in system of two blast gates, in series, to meter the munition pieces to the kiln and isolate the kiln from the ECR. Feed chute temperature is controlled to 240°F by the automatic admission of process water or decon. Temperature control is provided whenever the kiln temperature exceeds 500°F. The total feed chute water/decon flow is limited to 3 gpm (see FAWB Note B-5), otherwise, a waste feed cutoff is initiated to prevent excessive water flow into the kiln. Waste feed rate limits for each munition type are defined in the site-specific Resource Conservation and Recovery Act (RCRA) permits.

The charge-end subassembly, housing the charge-end seal, accepts munition components from the blast gates and feeds the rotary kiln. The kiln thermally deactivates and incinerates explosive and propellant components, and *volatilizes and partially combusts* residual agent. An internal spiral forces pieces to move from the charge chute to the discharge chute as thermal processing occurs. The kiln is fabricated of Rolled Alloy 253 MA, which can withstand a maximum shell temperature of 1600°F. The inside temperature of the kiln is controlled by a single, natural gas burner. The temperature also is affected by the nature of the materials being processed (i.e., energetics, fiberglass resin, and residual agent). The gas/air mixture is fired through a conventional, natural gas burner located in the discharge-end subassembly of the rotary kiln. At TOCDF, the burner end of the kiln is maintained at 1100°F when processing rockets. It is maintained at 1050°F for all other munitions (see FAWB Note B-6).

The rotary kiln is driven by a 5-hp, variable-speed, reversible motor. The motor drives a set of gears that turn a shaft connected to a set of trunnion rollers. Friction between the driven trunnion rollers and a tire on the kiln makes the kiln rotate. Thus, the kiln has a friction drive. The motor controller controls the motor speed such that the kiln rotates between 0 and 2.25 rpm, and the controller can cycle the motor between forward and reverse. The normal operating speed of the kiln is between 1.70 and 1.80 rpm for rockets and 1 rpm for all other munitions (see FAWB Note B-7). The kiln speed only exceeds 2 rpm when testing the kiln high-speed alarm, which is set at 2 rpm. The kiln drive gearbox has a bath-type lube oil system. Support for the kiln comes from two riding rings mounted on the outer circumference of the shell and floor-mounted trunnion bearings. A thrust bearing minimizes lateral movement. A separate lube oil system is provided to cool and lubricate the trunnion and thrust bearings.

The DFS kiln is equipped with an insulated shroud. Furnace room air is drawn into the shroud. Approximately 88%[3] of the shroud air volume flows toward the metal discharge end of the kiln. This cools the kiln metal shell to minimize heat loss to the room and provides heated, combustion air. The remaining 12% of the shroud air volume flows toward the feed end of the metal kiln. This also cools the kiln metal shell to help

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[3] Spilt of shroud-air flow to feed and discharge ends of kiln can vary based on the position of the shroud air dampers.

maintain the shell temperature below 1600°F. The shroud is insulated to further reduce furnace heat loss to the room.

The discharge-end subassembly directs scrap metal, ash, and residual glass fibers from the kiln to the HDC. The discharge conveyor accepts the material from the rotary kiln, conveys the material on a bucket conveyor, and provides a minimum residence time of 15 minutes at a minimum temperature of 1000°F, ensuring complete destruction of any residual agent to the 5X level of decontamination. The HDC has an electrically heated steel enclosure containing a bucket-type chain conveyor. The conveyor buckets overlap to prevent molten material from jamming the conveyor. The HDC discharges the scrap metal, ash, and residual glass fiber through a chute with dual blast gates to a portable residue bin that is enclosed in the HDC blast enclosure. When full, the bin is transferred first to a cooling area and then to the residue handling area (RHA).

The exhaust gases flow from the feed end of the kiln to the BLAD. The metal duct and the BLAD are designed to contain an explosive overpressure from 28.2 lb of TNT equivalent. The BLAD is designed to reduce the overpressure to normal operating pressure downstream. Next, the gases enter a refractory-lined cyclone that causes them to spin, throwing the large particles and fiberglass strands into the walls via centrifugal force. The inlet is on the side of the unit, and the outlet is directly on top of the cyclone. A discharge from the cone-shaped bottom is provided to empty collected solids into a *55-gallon drum*[4]. A slide gate is installed in the dropline just above the container for sealing off the dropline during container changes. The residue bin and the bottom section of the cyclone are enclosed in a ventilated enclosure to prevent the release of fugitive emissions during bin changeout[5].

The hot gases then flow into a vertical, cylindrical afterburner. The afterburner has two natural gas-fired burners located at the top. A combustion air blower using outside air provides the combustion air supply for these burners. The afterburner has internal refractory to minimize heat loss. From the afterburner, exhaust gases are drawn by the DFS PAS ID fan through a refractory-lined duct into the DFS PAS and DFS PFS at ANCDF, PBCDF, and UMCDF (see FAWB Note B-4). The exhaust gases flow to the DFS PAS for scrubbing and, at ANCDF, PBCDF, and UMCDF, to the DFS PFS for carbon filtration.

At TOCDF, furnace draft for the DFS is supplied by a single-speed, two-stage ID fan that is part of the DFS PAS. At ANCDF, PBCDF, and UMCDF, furnace draft also is supplied by ID fans; however, the ID fan configuration consists of two independent adjustable-speed drive (ASD) blowers.

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[4] *Site P&IDs XX-6-D-509 show a 3x3x3 ft sealed container at the DFS cyclone discharge. TOCDF uses a 55-gallon drum (Ref: ECP TEMP-1889-MDB R2). PBCDF and UMCDF have switched to a 55-gallon drum per ECPs PBAP1111DFS and UMSF0951DFS, respectively. It is expected that ANCDF will also use a 55-gallon drum.*

[5] See the Heating, Ventilation, and Air Conditioning (HVAC) FAWB, programmatic process FAWB Book 20, for more information on ventilation of the DFS cyclone enclosure.

2.3   PROCESS DESIGN BASIS SUMMARY

The DFS is designed to burn drained and sheared rockets, drained land mines, and energetics (i.e., fuzes, boosters, bursters, and/or supplementary charges) removed from projectiles and mortars. Miscellaneous parts (e.g., nose closures, fuze well cups, spacers) removed from projectiles and mortars by the projectile/mortar disassembly machines (PMDs) in the ECRs also are processed through the DFS. In addition to processing munition components, some other miscellaneous waste (e.g., bagged, agent-contaminated cleaning rags used during preventive maintenance) from the individual ECRs is destroyed in the DFS. Munitions that require DFS processing are listed for each of the four sites in Table 2.1.

Table 2.1   ANCDF, PBCDF, TOCDF, UMCDF Stockpile Items for DFS Processing

Munition Type	Model #	Agent Fill	Site(s)	Components Processed in DFS
115-mm rockets	M55	GB	AN/PB/ TE/UM	Rocket pieces, residual agent, and firing tube.
		VX	AN/PB/ TE/UM	
Land Mine	M23	VX	AN/PB/ TE/UM	Drained mine body, residual agent, fuze, activator, arming plug, burster, and booster pellet.
105-mm projectile[a]	M60	HD	AN	Fuze assembly, fuze well cup, and burster pieces.
	M360	GB	AN/TE	Fuze assembly (fuze and booster adapter) and burster pieces.
155-mm projectile[a]	M104	H	TE	Nose closure (fuze adapter and lifting lug), fuze well cup, and burster pieces.
	M110	H	TE	
		HD	AN	
	M121A1/ M121	GB	AN/TE/ UM	Nose closure (fuze adapter and lifting lug), spacer, supplementary charge, and burster pieces.
	M121A1	VX	AN, TE	
	M122	GB	AN, TE	
8-in. projectile[a]	M426	GB	AN/UM	Nose closure (fuze adapter and lifting lug), support, supplementary charge, and burster pieces.
		VX	TE, UM	
4.2-in. mortar[a]	M2	HT	AN/TE	Fuze and burster.
	M2A1	HD	AN/TE	

[a] For projectile and mortar processing, residual agent is not *normally* processed in the DFS; only energetics and miscellaneous parts are processed. *During these campaigns, however, small amounts of agent may be incinerated when processing agent-contaminated components from leaker projectiles and mortars.*

The DFS system is designed to operate automatically. All conveyors, gates, and furnace operations can be operated remotely from the control room (CON).

The complete DFS treatment process (i.e., rotary kiln and HDC) is designed to deactivate energetics separated from demilitarized munitions, and to heat the munition components to a minimum of 1,000°F and maintain this temperature for at least 15 minutes to attain 5X level of decontamination. The afterburner is designed to provide a minimum, overall gas residence time of 2.0 seconds, at or above 2000°F.

The kiln operates in the DFS room, an explosive containment area designed to withstand a 28.2-pound TNT equivalent detonation. The BLAD is designed to prevent such an explosion blast shock wave from reaching the PAS. The DFS could be damaged following a high order detonation of this magnitude and must be inspected for damage before processing continues.

2.4   SYSTEM BOUNDARIES AND INTERFACES

The DFS consists primarily of the government-furnished equipment (GFE) that comprises the furnace chambers, HDC, and supporting components and instrumentation. Major system interfaces include the following:

(1)   ECR: The DFS feed comes from the two ECRs in which various munition-processing activities take place. Rocket pieces, land mines, bursters, propellants, booster charges, and fuzes are gravity fed from each ECR through a feed chute. Each feed chute is provided with a built-in system of two blast gates, in series, to meter the munition pieces to the kiln and isolate the kiln from the ECR.

(2)   RHA: The noncombustible solid waste produced by the DFS is collected and transported to the RHA for disposal after being cooled.

(3)   PAS/PFS: The high temperature exhaust gases ($\geq 2000°F$) that are produced in the DFS are sent to the DFS PAS for quenching and neutralization and, at ANCDF, PBCDF, and UMCDF, to the DFS PFS (see FAWB Note B-4). A single-speed PAS ID fan at TOCDF and a variable-speed PAS ID fan at the other sites moves the gases through the DFS, and PAS/PFS.

(4)   Utilities: The DFS requires fuel gas, electric power, plant air, instrument air, process water, secondary cooling water, HVAC, decon supply, hydraulics, and life support air to operate.

SECTION 3
PROCESS DESCRIPTION

3.1   INTRODUCTION

The deactivation furnace system (DFS) is comprised of five subsystems: the rotary kiln, the heated discharge conveyor (HDC), the blast load attenuation duct (BLAD), the cyclone, and the slagging afterburner. The DFS subsystems are identical at all four facilities (i.e., ANCDF, PBCDF, TOCDF, and UMCDF).

The DFS is designed to continuously treat explosive components, propellant, and any residual agent from rockets or mines[1]. *Solid materials reside in the kiln for a minimum of 6 minutes as they travel the length of the kiln. Kiln exhaust gas temperature is maintained above 950°F during processing.* Exhaust gases exit the munitions demilitarization building (MDB) in an insulated, refractory-lined duct and are drawn, through the BLAD, into the cyclone where particulates are removed. Kiln exhaust gases are treated in an afterburner at *2000°F or higher* (see FAWB Note B-6). Afterburner exhaust gases flow to the DFS pollution abatement system (PAS) and DFS PAS filter system[2] (PFS), where they are quenched, neutralized, and filtered. Solid materials are discharged from the rotary kiln to the HDC for additional thermal treatment to ensure decontamination of the materials to the 5X level (i.e., a minimum of 15 minutes at 1000°F).

3.2   DESCRIPTION OF SUBSYSTEMS

3.2.1   Rotary Kiln

The DFS retort (DFS-FURN-101), more commonly referred to as the rotary kiln, is a steel-alloy cylinder comprised of five sections, bolted together. It measures 32 ft 10½ in. long by 5 ft 1 in. outside shell diameter. The kiln is located in the DFS room, an explosion containment area, due to the explosive nature of the materials it processes. The kiln rotates on, and is supported by, trunnion rollers. As the kiln rotates, an internal spiral baffle (a.k.a. flights) conveys the material through the length of the rotary kiln. A stationary subassembly is located at each end of the rotating kiln, one for charging the kiln and one for discharging. The charge end contains the feed chutes and exhaust duct (Exhaust gases flow countercurrent to the flow of solid parts in the kiln). The rotary kiln burner and the discharge chute are located at the discharge end.

The rotary kiln is surrounded by an air-cooled shroud designed to reduce heat transfer to the room. Room air enters the shroud through two dampers (16-HV-16 & -17) near the

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[1] *Explosive components and miscellaneous parts from leaker projectiles and mortars may also be contaminated with agent which also would be incinerated in the DFS.*

[2] The PFS is part of the designs at ANCDF, PBCDF, and UMCDF only. TOCDF does not, and will, not have a PFS (See FAWB Note B-4).

charge end of the kiln. A large portion of the air flows on the outside of the kiln, then into the kiln at the discharge end. The rest of the shroud air enters the charge end of the rotary kiln to cool the first section. This airflow reduces heat transfer from the kiln to the room, helping maintain room temperature below 150°F. It also provides combustion air for the material inside the kiln.

Airflow through the shroud is controlled by dampers at the shroud inlet ports. These dampers are adjusted by a hand-indicating controller from the control room (CON). The CON operator (CRO) has remote-manual control of these dampers. Excessive kiln shell and exhaust temperatures indicate insufficient shroud airflow or feed rates that are too high. Excessive firing of the burners (i.e., kiln or afterburner) indicates too much shroud airflow. When the shroud air dampers are in automatic, the control system does not modulate them. They are left in the position last set by the CRO, unless the *kiln* purge is not complete. If the *kiln* purge is not complete, the shroud air dampers are driven open so that the limit switch input to the DFS burner management system (BMS) is CLOSED. Once the PURGE COMPLETE input is received by the programmable logic controller (PLC), the shroud air dampers are released to automatic and driven to the operator's preset position. The PLC closes the shroud air dampers during predefined, DFS upset conditions *(see Appendix C)*.

Fuel gas is supplied to the rotary kiln through the fuel gas distribution system. Gas pressure is reduced from the gas distribution header pressure to 1.25 psig as it enters the fuel gas control rack, located just outside the MDB wall. The fuel gas safety shutoff valves (16-XV-356 & -359) and other controls are located outside the MDB, rather than in the DFS room, for ease of maintenance. Fuel flow rate is regulated by a flow control valve (16-FV-243). The control signal to this valve is determined by a flow controller that receives a signal from the kiln temperature controller. If the temperature is below setpoint, the flow control valve is modulated open; if above setpoint, the valve is modulated closed *(see FAWB Note B-16)*.

CH 2   At TOCDF *and ANCDF*, the kiln temperature is controlled by modulating the burner firing rate based on either the burner-end temperature controller (16-TIC-020), or the kiln exhaust gas temperature controller (16-TIC-182) [see FAWB Note B-8]. When 16-TIC-020 has control, the kiln burner is controlled by the gas temperature measured by a thermocouple[3] mounted at the burner-end of the kiln. When 16-TIC-182 has control, the kiln burner is controlled by the calculated average gas temperature measured by two sets of thermocouples[3] mounted in the kiln gas exhaust duct.

The burner-end setpoint is 1100°F for rockets and 1050°F for all other munitions (see FAWB Note B-6). The gas exhaust-end setpoint is 960°F for all munitions. During heatup, the burner-end temperature controller controls the kiln burner firing rate until the burner end is greater than 1050°F. Once the burner end reaches temperature, the exhaust-end controller controls the kiln burner if the exhaust gas temperature is less than 970°F (i.e., 10°F above the 16-TIC-182 setpoint). When the heat from the feed is sufficient to

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[3] *TOCDF originally used dual-element thermocouples, but replaced them with single-element ones. ANCDF, PBCDF, and UMCDF designs also included use of dual-element thermocouples. These sites will also be switching to use of single-element thermocouples* (see FAWB Note B-9).

maintain the exhaust gas temperature at 970°F, the burner-firing rate decreases sufficiently to allow the burner-end temperature to decrease. When the burner-end temperature decreases to 10°F below the 16-TIC-020 setpoint, burner control reverts back to the burner-end temperature controller, 16-TIC-020. For example, during rocket processing at TOCDF, if the exhaust-end temperature is below 970°F, after the burner-end temperature exceeds 1050°F, then the exhaust-end temperature controller modulates the burner-firing rate. If the burner-end temperature decreases below 1090°F, the burner-end controller takes control to maintain the burner-end temperature at 1100°F. If the exhaust gas temperature ever decreases below 970°F during processing, burner control shifts to the kiln-exhaust temperature controller (16-TIC-182).

The rotary kiln utilizes plant air to atomize exhaust duct quench water and to pressurize the charge-end air seal. Each of these applications has a separate pressure regulator to maximize flexibility. The pressure to the atomization line remains constant and is controlled by the pressure regulator. The pressure to the air seal also remains constant at a value chosen to maintain the desired seal between the charge-end subassembly and the rotary kiln.

A Fireye unit supervises burner operations and performs all burner safety functions required by the National Fire Protection Association (NFPA). The Fireye is connected to various, hard-wired interlocks in the BMS (see Appendix D). All furnace purging and lighting operations are done through the Fireye system, in conjunction with the PLC. The Fireye directly controls the fuel block valves, pilot valve, and burner igniter. The PLC controls the fuel and air control valves, and the blower. The Fireye signals the PLC to drive the controls to low-fire, high-fire, or auto at the proper stages of the ignition sequence. It also monitors the blower, control valves, and airflows to verify that they are in the correct state. If any safety interlock is violated, the Fireye immediately shuts down the burner and signals the PLC to shut down related equipment, as specified in the Alarm and Interlock (A&I) Matrix. The Fireye also locks out the burner, requiring the operator to manually reset the Fireye before burner operation can resume.

The kiln pressure is maintained more negative than the DFS room [TOCDF kiln normal operating pressure is –0.75 in. wc.; ANCDF plans to operate at 0.5 in. wc. (see FAWB Note B-17)]. Pressure instrumentation senses the kiln and room pressure and transmits the information to programmable logic controller (PLC) pressure controller 16-PIC-018. At TOCDF, where the DFS has a single-speed induced draft (ID) fan, the kiln pressure is controlled by modulating ID fan inlet damper 16-PV-018 to maintain the setpoint in the pressure controller. At all other sites, DFS primary chamber pressure is controlled by modulating the speed of the adjustable-speed drive (ASD) ID fans to maintain the setpoint in the pressure controller (see FAWB Note B-18). The ID inlet fan damper position remains fixed, based on the setpoint in damper controller 16-HIC-018. MANUAL operation mode, also available to operators, allows the kiln pressure to be controlled in a manner similar to TOCDF. In MANUAL mode, ID fan speed can be maintained constant based on a speed entered into ID fan speed controller 24-HIC-773A for the first stage, and into ID fan speed controller 24-HIC-066A for the second stage. The ID fan inlet damper then can be manually positioned to maintain the desired pressure in the primary chamber.

TOCDF added wide-range pressure transmitter 16-PIT-018A that provides pressure indication and alarms during upsets in which the furnace pressure becomes more negative than the range of 16-PIT-018 (see FAWB Note B-19).

The rotary kiln is driven by a 5-hp, variable-speed motor and a variable-frequency motor controller. The motor controller drives the rotary kiln in forward or reverse at a rate between 0 and 2.25 rpm. The kiln operating speed is between 1.70 and 1.80 rpm for rockets, and 1 rpm for all other munitions (see FAWB Note B-7). The kiln speed only exceeds 2 rpm when testing the high-speed alarm, which is set at 2 rpm. The motor runs in forward during normal processing. If processing must be stopped while the kiln contains burning material, the kiln oscillates to prevent energetic materials from exiting the kiln, and to minimize potential damage from localized heating. In oscillation mode, the kiln rotates 3/4 revolution forward, and then reverses 3/4 revolution back. The default oscillation speed setting is 1 rpm. The rotary-kiln speed is controlled by an adjustable-frequency drive controller. A PLC control loop provides power frequency feedback from the drive motor to the controller.

The PLC calculates the rotary-kiln speed, based on a proximity sensor that senses eight ferromagnetic bars spaced evenly around the rotary kiln circumference. As the rotary kiln turns, successive bars pass the sensor, sending pulses to the PLC. The speed calculated from the pulse intervals is used for console screen indication only, not for speed-control feedback to the motor controller. Both the calculated rotational speed and the frequency-drive, controller-signal speed are displayed in the CON for comparison by the CRO.

The kiln can be "bottled-up" in the event that the afterburner or downstream components are no longer operable or able to continue with agent processing. The "bottle-up" procedure is considered if the afterburner cannot be maintained above 1500°F, and the kiln and/or DFS room are contaminated with agent. A pneumatically operated, slide gate valve (16-XV-862) is installed *in the 44-inch duct* between the DFS cyclone and the afterburner to isolate the kiln exhaust *(see FAWB Note B-20)*. This configuration allows the afterburner to operate without drawing from the kiln, and also isolates the kiln so that potentially agent-contaminated exhaust is not drawn through the afterburner, when the afterburner is not at temperature[4]. *Solenoid valves powered by the UPS control the air supply to the slide gate* to permit isolation of the kiln exhaust even if offsite power is lost. Inlet air to the afterburner *is* supplied through a *20*-inch air intake that normally has a blind flange*, except at TOCDF where they have a mechanical locking device to lock air-intake damper 16-HV-863 in the closed position.* After the blind flange is removed, *or the locking device is removed from 16-HV-863 at TOCDF,* and the slide gate valve is verified closed, 16-XV-863 *(16-HV-863 at TOCDF) opens to allow* inlet air to the afterburner *(see FAWB Note B-21). At follow-on sites, 16-XV-863 is interlocked from opening unless 16-XV-862 is closed and at least one stage of the ID fan is running.*

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[4] *TOCDF has integrated use of 16-XV-862 and 16-HV-863 into normal startup and shutdown procedures to prevent drawing exhaust from the kiln into the afterburner when the afterburner is not at temperature (see sections 3.3.1 and 3.3.7).*

3.2.1.1 Rotary Kiln Feed/Discharge

DFS feed comes from two explosive containment rooms (ECRs) in which various munition processing activities take place. Rocket pieces, land mines, bursters, propellants, booster charges, fuzes, and projectile miscellaneous parts are gravity fed from each ECR through a feed chute. Each feed chute has a built-in system of two blast gates, in series, to meter the munition pieces to the kiln and isolate the kiln from the ECR. The top gates, MMS-GATE-101/102, are slide gates located in each ECR. These gates open to allow the munition pieces to drop into the feed chutes, where the pieces are held by the tipping gates, DFS-GATE-101/102, located in the feed chutes. The tipping gates open to feed the munition pieces to the furnace after the top gate has closed. If the top gate malfunctions after dropping munition pieces into the chute, the tipping gate will cycle to feed the pieces to the furnace to prevent the pieces from being heated in the feed chute.

DFS munitions feed can occur only during normal operations (i.e., no feed inhibit interlocks in effect), after DFS operator request. The DFS operator requests feed by selecting the FEED MUNITIONS icon on the control system console. DFS feed does not resume automatically when interrupted by an interlock, or by the operator; the operator always must manually initiate feed. When DFS feed is initiated, the DFS controller issues a DFS NORMAL digital intercontroller communication output (DICO) to the ECR controllers. This DICO allows the ECR controllers to begin automatic shearing operations on the rocket shear machine (RSM)/burster size reduction (BSR) *(see FAWB Note B-22)*. Upon completion of a shearing sequence, the ECR controller issues a FEED READY DICO to the DFS controller indicating that sheared materials are present on the upper feed gate.

Site-specific Resource, Conservation, and Recovery Act (RCRA) permits regulate DFS feed rates for the weight of residual agent from rockets and mines, and for the weight of propellant, explosives, and pyrotechnics for all munitions. *These feed rates are the basis for establishing RCRA munition feed rate limits. Site-specific* setpoints are listed in Appendix C. Waste feed rate limits vary depending on the RCRA-defined operational period in which the plant is operating.

At TOCDF, the agent feed rate RCRA stop feed alarm is generated if the total pounds of agent fed to the DFS within the last hour exceeds the RCRA permissible limit. Pre-alarms are provided for each ECR to prevent cycling the feed gates if feed of the waste from that ECR would cause the DFS agent feed RCRA hourly limit to be exceeded. The explosive feed rate RCRA stop feed alarm*s for rockets *and projectiles are* generated if the number of rockets *or projectiles* fed to the DFS within the last hour exceeds the RCRA permissible limit. Pre-alarm*s are* generated to prevent cycling *the* feed gates if feed of another *rocket/projectile* would cause the DFS feed RCRA hourly limit to be exceeded.

There are jam sensors located in the kiln feed and discharge chutes. If the feed chute sensors detect a jam for more than 10 seconds, the DFS controller stops feed and activates an alarm. If the discharge sensor detects a jam, the DFS controller stops feed, oscillates the kiln, and activates an alarm.

For rocket processing, DFS feed is based on the home position switch (16-ZS-015 at TOCDF, 16-SS-015 at follow-on sites). When *the switch* is made and the DFS controller receives a FEED READY DICO, the feed gates cycle to allow material into the DFS. The next load cannot enter the DFS until the home position switch is made again *(one kiln revolution).* If both ECRs are in operation, *rockets* are fed alternately from each ECR. For example, an entire rocket is processed from one ECR before switching to feed from the other ECR. If there is a delay with one ECR line of more than 30 seconds, the other ECR line continues to feed alone until the problem clears and alternate feed resumes.

Projectile and mine feed to the DFS is not based on the home position switch. Instead, munition pieces are fed whenever feed is available and the DFS is ready to accept feed.

Temperature can be controlled on the upper feed gate by a spray system that helps prevent premature combustion of the feed material and also washes propellant into the DFS feed chute (see FAWB Note B-5). *At all sites except TOCDF,* a dedicated process water line supplies flow to the spray nozzles. *Normally,* operation of the spray is *MANUAL* from Advisor PC Screen DFM. The CRO activates the spray whenever feed material on the upper gate cannot be fed into the furnace. The frequency and duration of the spray is at the discretion of the CRO. *If a fire is detected on the slide gate by 03-XE-161/162, the spray actuates automatically for 5 seconds. The gates then are cycled if DFS feed permissives are met.* At TOCDF, flow to the spray nozzles is taken from the supply line to the shear spray. Thus, the spray can be either water or decon, depending on the selection for the current campaign (see the RHS *and PHS* FAWB*s*, Programmatic Process FAWB Book*s* 21 *and 22, respectively*). *The spray at TOCDF can be operated in MANUAL or AUTO. In AUTO mode, the spray turns on for five seconds every three minutes (see FAWB Note B-5).*

Temperature is controlled in the feed chutes between the feed gates by water/decon sprays that help prevent premature combustion of the feed material (see FAWB Note B-10). A hand switch allows the CRO to select either decon or water. Water normally is selected for temperature control during all campaigns (see FAWB Note B-11). A thermocouple in each feed chute sends a signal to a temperature controller *via a temperature transmitter*. The controller maintains temperature at the setpoint, normally 240°F, by signaling a control valve to modulate the process water flow to the spray nozzle in the chute. As the temperature increases above setpoint, the flow control valve is modulated open; if the temperature is below setpoint, the valve is modulated closed. To prevent leakage into the chute, a block valve on each water/decon line closes whenever the DFS exhaust temperature is below 500°F.

TOCDF added a high-pressure wash system to remove residue that can prevent the tipping gate from fully closing (see FAWB Note B-23). The high-pressure wash system delivers hot water/steam to three pairs of nozzles positioned to clean the top and bottom of the tipping gate as well as the seat area. The wash is manually activated by an operator in the mechanical equipment room (MER).

3.2.1.2 Rotary Kiln Exhaust Gas

Rotary kiln exhaust gases exit the kiln from the feed end. Air-atomized, quench water is sprayed directly into the exhaust duct for temperature control. A flow control valve (16-TV-008) regulates the spray, based on the averaged temperature reading of two

thermocouples that record exhaust gas temperatures downstream of the spray. This averaged temperature reading is sent to a temperature controller that signals the flow control valve to modulate open or closed. If the average temperature is above the setpoint, the flow control valve is modulated open, allowing more water spray. If the average temperature is below the setpoint, the valve is modulated closed. At TOCDF, the exhaust gas temperature controller setpoint is 1525°F (see FAWB Note B-12). A block valve (16-XV-213) in the water line closes if the temperature is below 1000°F to prevent water leakage into the duct.

3.2.1.3 Rotary Kiln Combustion Air

The retort (a.k.a. kiln) combustion air blower (DFS-BLOW-101), located in the DFS room, supplies combustion air to the kiln burner. Air is drawn from the DFS room through a vertical blower inlet duct. An annubar[5], corrected for pressure and temperature, measures the combustion airflow, which is displayed in the CON in standard cubic feet per minute (scfm). Blower airflow is controlled by a modulating *inlet* damper. The combustion airflow controller (16-FFIC-021) receives a setpoint from the fuel gas flow controller (16-FIC-243). Based on this setpoint, the airflow control damper (16-FV-021) is modulated to achieve an airflow that is in excess of the stoichiometric requirement for fuel flow. The controller operates in ratio mode, initially set to an air-to-fuel ratio of 12:1 (i.e., 20% excess air; stoichiometric ratio is 10:1).

The combustion air blower is provided with variable-position inlet vanes. In automatic, the vanes are partially open at low airflows to prevent blower surging, and fully open at high airflows. Vane position can be selected by the CRO in remote-manual mode.

3.2.1.4 Rotary Kiln Lubrication

An oil bath, lube-oil system lubricates the DFS gearbox. Lube oil from the oil bath circulates through a water-cooled heat exchanger by an autoreversing pump that is driven by the *gearbox input shaft*. The autoreversing feature maintains the same oil flow direction when the kiln is rotating in reverse, during oscillation mode. The gearbox, lube-oil system has individual and common alarms to indicate trouble. Low-lube oil level is displayed in the CON. Low flow, high temperature, low level, and low pressure display individually on the local panel, and as a trouble alarm in the CON. Whenever the rotary kiln is in oscillation mode, the trouble alarm is masked to avoid nuisance alarms resulting from low flow due to low shaft speeds when changing directions.

A separate, lube-oil system cools and lubricates the trunnion and thrust bearings. This system consists of a lube-oil reservoir, cooler, distribution pumps, and associated piping and instrumentation. Two motor-driven gear pumps supply lube oil to the trunnion bearings. Either pump can be designated as primary from the console pump select screen. The trunnion bearing, lube-oil system has local and remote alarms to indicate trouble. A low-pressure alarm starts the secondary pump after 10 seconds. If the primary and/or secondary pumps do not clear the low-pressure alarm within 30 seconds, the controller stops the feed, stops the kiln drive, and initiates an alarm. A low level in the

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[5] *Annubars are averaging pitot tubes with multiple ports to measure flow velocity at multiple points.*

reservoir alarms in the CON; a low-low level also alarms in the CON, and stops DFS feed. In addition to these three alarms, high lube-oil supply temperature, high differential pressure across either lube-oil filter, and low lube-oil flow to any bearing alarms at the local panel, and sends a common trouble alarm to the CON. There also is a pump malfunction alarm for the lube-oil pumps.

3.2.2   DFS Heated Scrap Discharge Conveyor

The DFS heated scrap discharge conveyor (DFS-CNVX-101), more commonly referred to as the HDC, is a 60-ft-long bucket conveyor inside an insulated, steel housing. The feed end of the HDC is connected to the kiln discharge assembly and located in the DFS room. Kiln waste products such as metal and fiberglass scraps fall directly onto the bucket conveyor. The material is carried to the HDC discharge end, located in a blast enclosure outside the DFS room wall. Two banks of electric heaters maintain the temperature of the material on the bucket conveyor at or above 1000°F. The speed of the bucket conveyor ensures the material is maintained at an elevated temperature for at least 15 minutes to achieve decontamination to the 5X level. The HDC discharges into a residue waste bin located inside the blast enclosure.

Each heater bank is controlled by an adjustable, time-proportional controller with a setpoint of 1100°F. Heaters are cycled on and off in 2 minute intervals to achieve the specified output. It can be 0%, or continuously off (i.e., on for 0 minutes, off for 2 minutes); 100%, or continuously on (i.e., on for 2 minutes, off for 0 minutes); or any proportion in between (i.e., 50%, on for 1 minute, off for 1 minute). The controller varies the cycle intervals to maintain a tight temperature band around the setpoint. Each controller is equipped with high and low temperature alarms. The setpoints and actions of the alarms are listed in the A&I matrix. If an alarm condition results in the shutdown of the HDC or a heater bank, the DFS controller automatically restarts the heaters when the alarm condition clears.

There are two conditions to consider during HDC startup: waste on the conveyor and waste not on the conveyor. *At all sites except TOCDF, in* automatic, the PLC assumes waste is on the conveyor. The heaters are on[6], and the conveyor does not start until the HDC reaches normal operating temperature of 1010°F for both upper and lower thermocouples. *At TOCDF, the HDC must be started in MANUAL, but can be started in either slow or fast speed. After the HDC reaches normal operating temperature of 1010°F for both upper and lower thermocouples, the CRO places the HDC in AUTO and it continues running at the selected speed.*

If the HDC temperature drops below 1000°F at either upper or lower thermocouple after the conveyor has reached operating temperature, the conveyor drive motor and the rocket tracking HDC residence timer are stopped by the PLC. Both the HDC drive and rocket tracking HDC residence timer restarts when the HDC temperature again reaches 1010°F. This ensures the HDC waste discharge is processed to the 5X decon level (i.e., 1000°F for 15 minutes).

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[6] *At all sites, if the HDC temperature decreases below 800°F, a hardwired interlock prevents the heaters from being energized until the HDC conveyor is running.*

Upon startup, if the rocket tracking software determines there is no waste on the conveyor, the CRO starts the conveyor drive motor in manual, or fast speed. The CRO places the drive motor in automatic after the HDC temperature reaches 1010°F. This allows the conveyor to heat more evenly, and minimizes thermal stress in the conveyor as it heats up.

The HDC is powered by a two-speed, 1-hp motor. At high speed, materials travel the conveyor length in *approximately 18* minutes; at low speed, materials travel the conveyor length in *approximately 36* minutes. In automatic, the HDC starts in fast speed with both heater banks operating. Motor current indication and a high current alarm in the CON are provided to detect high torque caused by a jam on the conveyor. A speed switch (16-SSL-057) at the tail shaft senses conveyor motion. When the switch senses zero motion, DFS feed is stopped, and the kiln begins to oscillate to prevent additional material from being added to the nonmoving conveyor. Also, if the jam sensor (16-XS-019) located in the kiln discharge chute senses a buildup of material for more than 10 seconds, feed is stopped and the kiln begins to oscillate.

At the HDC discharge, the buckets dump waste materials, through a chute, into the residue waste bin. Inside the chute is a tipping bucket gate (16-XY-047 at TOCDF; 16-XY-060 at follow-on sites) followed by a slide gate (16-XY-061A) that isolates the residue waste bin from the HDC during bin changeout. The tipping bucket gate can hold the residue from four rockets. Jam sensors are located above both the tipping bucket gate and the slide gate. If either of these sensors detects a jam for more than 10 seconds, the DFS controller stops feed, oscillates the kiln, stops the HDC drive, and activates an alarm.

During normal operation, both the tipping bucket gate and the slide gate are open. Blast protection is provided by the HDC blast enclosure surrounding the residue bin. The bin can hold the residue from approximately forty-five rockets. The residue bin is connected to the discharge chute by a flexible coupling that forms an air seal. A residue bin must be in position before the discharge chute slide gate can be opened.

When the residue bin is full, the CRO closes the tipping bucket gate and slide gate. When the slide gate is closed, the outside operator initiates bin changeout by actuating local hand switches to deflate the HDC blast enclosure blast door seal, and open the blast door.

After the blast door is opened, the outside operator connects a handle to the residue bin and pulls the bin out. The operator then *removes* the full bin, and replaces it with an empty bin *(see FAWB Note B-24)*. The empty bin is pushed into the blast enclosure under the discharge chute. The outside operator closes the blast door and inflates the blast door seal from the local control panel. With the blast door closed and sealed, and a bin in position, the controller opens the slide gate, verifies the open position, and then opens the tipping bucket gate. The full residue bin is transferred to a cooling area, then moved to the residue handling area (RHA).

During normal operation, bin changeout can be accomplished within four minutes. Feed is continued to the DFS during bin changeout, and the HDC drive motor remains on.

An alarm is provided to stop feed, stop the HDC drive motor, and oscillate the kiln if bin changeout is not completed within 6 minutes. The bin changeout timer starts after any of the following occurs: 1) the tipping bucket gate is closed, 2) the lower discharge gate is closed, or 3) at follow-on sites only, the bin is full. The 6-minute-maximum changeout time is based on a tipping bucket capacity of four rockets while processing at a rate of 38 rockets/hr. A software interlock prevents the lower discharge gate from re-opening until a waste bin is verified to be in position by 16-ZS-183.

3.2.3 Blast Load Attenuation Duct

The DFS kiln processes energetics that can result in a detonation. Therefore, the exhaust duct leading from the kiln is equipped with a BLAD (DFS-BLAD-101), outside the MDB, to prevent a 28.2-lb TNT equivalent blast shock wave from reaching the DFS PAS. The BLAD consists of a short section of duct that is wider than the rest, where several concentric baffle plates are mounted. The larger cross section of the BLAD, combined with the baffle plates, acts to dissipate any pressure wave from the kiln.

3.2.4 DFS Cyclone

Kiln exhaust gas enters the refractory-lined DFS cyclone (DFS-SEPA-101), a vertical cylindrical chamber with a tangential inlet near the top. The cyclone is designed to separate particulates from the gas stream going to the afterburner. Centrifugal force causes the particulates to travel to the side wall of the chamber, where friction slows them and causes them to fall to the conical bottom. The particulates then fall into a residue bin. The residue bin and the bottom section of the cyclone are within a ventilated enclosure to prevent fugitive emissions from escaping uncontrolled into the environment. The only instrument associated with the cyclone is a differential pressure switch that alarms at 2-in. wc to indicate an obstruction in the cyclone.

3.2.5 DFS Slagging Afterburner

The DFS slagging afterburner (DFS-FURN-102) is a vertical, refractory-lined, cylindrical chamber located just outside the PAS building. It has two fuel gas burners mounted at the top of the side wall. Kiln exhaust gases pass through the cyclone, enter the afterburner from the top, are heated by the burners to a temperature of *2000°F or higher* (see FAWB Note B-6), and exit from the side at the bottom. Combustion air and fuel gas enter the chamber through the burners. Thermocouples located near the exhaust gas outlet measure chamber temperature, and modulate burner fuel and combustion air supply, as required *to maintain the setpoint temperature*.

The DFS secondary combustion air blower (DFS-BLOW-102) draws air from the PAS building, through the blower inlet duct, to the afterburner. An annubar *(see footnote 4 on page 3-7)*, corrected for pressure and temperature, measures the combustion airflow, which is displayed in the CON in standard cubic feet per minute (scfm). Airflow is controlled by a modulating *inlet* damper. The combustion airflow controller receives a setpoint from the fuel gas flow controller, and modulates the damper to achieve an airflow *that is calculated based on* the stoichiometric requirement for fuel flow. *Thus,* the controller operates in a ratio mode, *where the stoichiometric ratio is 10:1. TOCDF currently operates at a ratio of 6:1, which is 40% substoichiometric.*

The combustion air blower is provided with variable-position, inlet vanes. In automatic, the vanes are partially open at low airflows to prevent blower surging and fully open at high airflows. The CRO can select the vane position in remote-manual mode.

Fuel gas is supplied to the afterburner through the fuel gas distribution system. Fuel gas pressure is reduced from the distribution header pressure to 1.25 psig as it enters the fuel gas control rack*s*. Flow control valves modulate the fuel flow rate to each burner.

A Fireye unit supervises burner operations and performs all burner safety functions required by the National Fire Protection Association (NFPA). The Fireye is connected to various, hard-wired interlocks in the BMS (see Appendix D). All furnace purging and lighting operations are done through the Fireye system, in conjunction with the PLC. The Fireye directly controls the fuel block valves, pilot valve, and burner igniter. The PLC controls the fuel and air control valves, and the *combustion air* blower. The Fireye signals the PLC to drive the controls to low-fire, high-fire, or auto at the proper stages of the ignition sequence. It also monitors the blower, control valves, and airflows to verify that they are in the correct state. If any safety interlock is violated, the Fireye immediately shuts down the burner and signals the PLC to shut down related equipment, as specified in the Alarm and Interlock (A&I) Matrix. The Fireye also locks out the burner, requiring the operator to manually reset the Fireye before burner operation can resume.

Afterburner temperature is controlled by modulating the burner-firing rate. The burners are controlled by the calculated average gas temperatures measured by two sets of dual-element thermocouples (see footnote 3 on page 3-2) that provide input to the temperature controller (16-TIC-092). The temperature controller provides a signal to the fuel flow controllers. *If the temperature is below setpoint, the flow control valve is modulated open; if above setpoint, the valve is modulated closed (see FAWB Note B-16).*

The temperature controller also is used for low- and high-temperature, pre-alarm and "stop feed" signals, as defined in the A&I matrix.

Other temperature interlocks and alarms are taken from an independent set of dual-element thermocouples (see footnote 3 on page 3-2), with several temperature switches tripping off this signal. Temperature interlock details are listed in the A&I matrix.

A refractory ring lines the afterburner chamber exhaust-duct outlet. This refractory ring induces a pressure drop that is used to measure the exhaust stream flow rate. Exhaust stream flow rates are used to calculate the residence time of the gases in the afterburner. The minimum residence time in the afterburner is 2.0 seconds at a temperature of at least 2000°F. The differential pressure signal is displayed in the CON. High differential pressure initiates an alarm and stops DFS feed. The differential pressure signal also is converted to volumetric flow rate and residence time indications.

3.3   CONTROL SEQUENCE LIST

This section presents the control sequences for DFS startup, munitions feed, munitions stop feed, furnace relight, power loss, normal shutdown, and emergency shutdown. The control sequences are based on the TOCDF standing operating procedures (SOPs), and on PLC and BMS logic. Detailed operator contingency responses to upset conditions and special operating conditions can be found in TOCDF DFS furnace operations SOP No. TE-SOP-004.

3.3.1   DFS Startup Sequence

DFS startup steps are as follows:

(A)   Line up valves, including fuel gas, instrument air, process water, plant air, secondary cooling water, hydraulics, decon, and lube oil. Line up switches for remote operation, and close all blast gates and doors.

(B)   Verify DFS PAS is normal and kiln exhaust isolation valve, 16-XV-862, is closed with the instrument air supply locked out and DFS afterburner air intake valve, 16-HV-863, is open (see FAWB Note B-21).

(C)   Enter setpoint of –1.5 in. wc. into DFS afterburner pressure controller, 16-PIC-065 (ID fan inlet damper control automatically shifts from 16-PIC-018 to 16-PIC-065 when 16-XV-862 is closed). See FAWB Note B-20 for 16-XV-862 operation at ANCDF and UMCDF.

(D)   Place *DFS afterburner* control screens in AUTO. *Select system purge permissive and press start. If PAS NORMAL conditions exist, the DFS afterburner combustion air blower starts.* The PLC drives combustion air dampers open. Once valves are fully open and minimum purge airflow is established, the DFS BMS purge timer, set for *8* minutes[7], starts. Once the system purge timer times out, the afterburner combustion air valves are driven to low-fire position *and the DFS afterburner air intake valve ramps to low-fire CV.*

(E)   When system purge is complete, initiate afterburner light-off. *Insert a setpoint of 2150°F (Note: TOCDF setpoint; see FAWB Note B-6) into the afterburner temperature controller, 16-TIC-092.* Burner light-off is not automatically initiated by the PLC. Instead, the operator must toggle each control screen, burner start switch from the CON. Then, the PLC initiates the following Fireye ignition sequence:

(1)   The Fireye checks to verify safety interlocks are satisfied, which includes ensuring that running interlocks are made and fuel block valves are closed.

(2)   If system purge is complete, the Fireye starts the internal, 60-second purge timer. When complete, the ignition sequence continues.

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[7] The purge time was specified to provide *at least four changes* of furnace system volume changes prior to lighting the burners*, per NFPA 86.* The timer value may change for sites with a PFS, due to the volume added to the system by the DFS PFS.

(3) The Fireye verifies low-fire position of the combustion air and fuel gas valves.

(4) The Fireye energizes the burner igniter, opens the pilot fuel gas for pilot-burner trial for ignition, and proves flame presence within 10 seconds by means of the flame scanner. If the flame is not verified, burner lockout occurs.

(5) If the pilot flame is verified, the Fireye energizes the main fuel gas, safety-shutoff valves for main burner ignition trial. After 10 seconds, the Fireye closes the pilot fuel-gas valve, de-energizes the igniter, and continues to scan the flame. If flame is lost at any time, burner lockout occurs.

(6) The Fireye sends a signal to the PLC to resume control of the air and fuel control valves in automatic mode.

(7) The PLC holds the air and fuel gas control valves at the low-fire position for 30 minutes to heat the burner block.

(F) The PLC ramps up afterburner temperature at a rate of 100°F/hr until temperature reaches 1200°F. Afterburner temperature is held at 1200°F for 8 hours to soak the afterburner refractory. Finally, the PLC ramps up afterburner temperature at a rate of 150°F/hr until temperature reaches *the afterburner temperature controller setpoint*.

(G) When the afterburner temperature reaches 1500°F, the PLC automatically starts the kiln lube-oil pump, starts the HDC heaters, and starts kiln oscillation.

(H) There are two conditions to consider during HDC startup, waste on the conveyor and no waste on the conveyor.

(1) In automatic mode, the PLC assumes waste is on the conveyor. The heaters are on and the conveyor starts when the HDC temperature, at both the upper and lower thermocouples, reaches 1010°F. If the temperature drops below 1000°F at either the upper or lower thermocouple, after the conveyor has reached normal operating temperature (i.e., above 1010°F), the conveyor-drive motor and the rocket-tracking, HDC residence timer are stopped by the PLC. Both the HDC drive and rocket-tracking, HDC residence timer restart when the HDC temperature again reaches 1010°F. This ensures the waste discharge from the HDC is properly processed to a 5X condition (i.e., 15 minutes at 1000°F).

(2) Again upon startup, if rocket-tracking software determines there is no waste on the conveyor, the CRO starts the conveyor drive motor in manual, or fast speed. This allows the conveyor to heat more evenly, and minimizes thermal stress in the conveyor as it heats up. The CRO places the drive motor in automatic after the HDC temperature reaches 1010°F.

(I) *After the afterburner temperature >1850°F, an outside operator unlocks the kiln exhaust isolation valve, 16-XV-862. The CON operator then opens the valve from Advisor PC control screen DFA and verifies that the air intake valve, 16-HV-863, ramps closed (see FAWB Note B-21). The outside operator then locks out the*

instrument air supply to the 16-HV-863 and locks open 16-XV-862. See FAWB Note B-20 for 16-XV-862 operation at ANCDF and UMCDF.

(J)   Insert a setpoint of –0.75 in. wc. into the kiln pressure controller, 16-PIC-018. Switch ID fan damper 16-PV-018 control from the DFS afterburner pressure controller, 16-PIC-065, to 16-PIC-018 (Note: At follow-on sites, ASD control will switch from 16-PIC-065 to 16-PIC-018).

(K)   Place kiln burner control screen in AUTO. Select kiln purge permissive and press start. If PAS NORMAL conditions exist, the kiln combustion air blower starts. The PLC drives the combustion air damper to high-fire and the shroud air dampers 100% open. When kiln purge is complete, the PLC drives the combustion air dampers to low-fire and the shroud air dampers to their setpoint. To light the kiln burner, the operator toggles the kiln burner start switch on the control screen which initiates the Fireye ignition sequence. The following steps are followed by the Fireye to light the kiln burner:

(1)   The Fireye checks to verify safety interlocks are satisfied, which includes ensuring that running interlocks are made and fuel block valves are closed.

(2)   When the kiln purge is complete, the Fireye starts the internal, 60-second purge timer. When complete, the ignition sequence continues.

(3)   The Fireye verifies low-fire position of the combustion air and fuel gas valves.

(4)   The Fireye energizes the burner igniter, opens the pilot fuel gas valve for pilot-burner trial for ignition, and verifies flame presence within 10 seconds by means of the flame scanner. If the flame is not verified, burner lockout occurs.

(5)   If the kiln pilot flame is verified, the Fireye energizes the main, fuel-gas, safety-shutoff valves for main burner ignition trial. After 10 seconds, the Fireye closes the pilot, fuel-gas valve, de-energizes the igniter, and continues to scan the flame. If flame is lost at any time, burner lockout occurs.

(6)   The Fireye sends a signal to the PLC to resume control of the air and fuel control valves in automatic mode.

(7)   The PLC holds the air and fuel-gas control valves at the low-fire position for 30 minutes to heat the burner block.

(L)   Insert a setpoint of 1100°F for processing rockets and *1050*°F for other munitions into the kiln temperature controller (see FAWB Note B-6). The PLC ramps up the kiln temperature at a rate of 100°F/hr until temperature reaches 500°F. Kiln temperature is held at 500°F for six hours. Finally, the PLC ramps up the kiln temperature to normal operating temperature at a rate of 100°F/hr.

(M)   Activate the feed chutes and kiln exhaust quench sprays by inserting temperature setpoints of 240°F and 1525°F, respectively (see FAWB Note B-12).

(N)   After the kiln reaches normal operating temperature, the operator sends a
         command to run the kiln in forward, unless feed is initiated.

3.3.2   Munitions Feed

After the kiln, HDC, and afterburner reach normal operating temperatures and all stop-feed interlocks are clear, the operator initiates munitions processing by selecting the START FEED icon on the console advisor screen and pushing the START key. Then, the DFS controller sends a feed DICO to the ECR controllers, as described previously. This process continues indefinitely until either interrupted by a stop feed interlock (see the A&I matrix), or manually terminated by the operator.

3.3.3   Miscellaneous Waste Feed

To process miscellaneous waste in the DFS, the CRO selects the WASTE icon on Advisor PC screen DFM and verifies that the miscellaneous waste feed mode is activated. The CRO enters the weight of the waste to be processed. The PLC calculates a total waste amount that includes the weight entered and any other waste processed during the current hourly interval. If the total waste exceeds the DFS miscellaneous waste RCRA allowable limit, an alarm is generated and the waste cannot be fed. To allow waste feed, the waste size must be reduced. If the total waste is less than the DFS miscellaneous waste RCRA allowable limit, the PLC calculates a total agent amount based on the entered weight of the waste and any agent processed during the current hourly interval. For the calculation, the entire waste weight is assumed to be agent. If the total is less than the DFS agent feed RCRA limit, the waste may be fed to the furnace. If the total exceeds the DFS agent feed RCRA limit, an alarm is generated and the waste cannot be fed. To allow waste feed, either the waste size must be reduced or processing continues until the waste amount does not cause the DFS agent feed RCRA limit to be exceeded.

If no alarms are displayed, the CRO initiates miscellaneous waste processing by selecting the START FEED icon on the advisor screen and pushing the START key. Then, the DFS controller sends a feed DICO to the ECR controllers. The CRO selects the MANUAL FEED icon and pushes the START key to cycle the gates that feed the waste to the DFS.

3.3.4   Stop Munitions Feed

The operator stops feed by selecting the START FEED icon on the console advisor screen and pushing the STOP key. Stopping feed simply withdraws the feed DICO to the ECR. The controller completes the gate-cycling process if the DFS controller is in the middle of cycling the blast gates to feed munitions when feed is stopped, or if any munition pieces have been dropped onto the lower blast gate. Any pieces already fed to the kiln at the time a STOP FEED occurs continue to be processed through the kiln and HDC in the normal manner.

When a STOP FEED interlock clears, munition feed does not automatically resume; the operator must manually initiate processing.

3.3.5   Furnace Relight

During normal operation, if any condition for safe burner operation is lost, the Fireye unit shuts down and locks out that burner. The PLC drives the fuel-gas and combustion-air modulating valves to low-fire. Resume operations via the following steps:

(A)   Activate the burner RESET and START switches.

(B)   The Fireye initiates the burner ignition sequence.

(C)   Ensure running interlocks are made and fuel block valves are closed. The Fireye checks to verify safety interlocks are satisfied.

(D)   If relight of the afterburner is required, the PLC and Fireye establish the system purge. If the furnace already is at or near normal operating temperature, a new purge would result in significant loss of temperature and needless delay for reheat. If specific conditions exist, burner relight is permitted in accordance with the NFPA guidelines for safe operation without a significant disruption of operation.

   (1)   If the afterburner temperature is at or above 1400°F, *a system purge is not required (i.e., SYSTEM PURGE is maintained; see Appendix D)*.

   (2)   If at least one afterburner burner is on and system flow has been maintained *(see FAWB Note B-25)*, *a system purge is not required (i.e., SYSTEM PURGE is maintained; see Appendix D)*.

   (3)   If the system purge is not complete, the PLC drives the combustion-air valves and shroud-air dampers open. The DFS BMS system-purge timer starts once the valves are full open and minimum purge airflow is established. The combustion-air valves are driven to low-fire position when the afterburner purge time is complete.

(E)   If relight of the kiln burner is required, the PLC and Fireye establish the kiln purge.

   (1)   If the kiln burner-end temperature is at or above 1400°F, system flow has been maintained (*see FAWB Note B-25)*, *and system purge is complete,* kiln purge is *not required (i.e., KILN PURGE is maintained; see Appendix D)*. This is not a likely condition since the operating temperature of the kiln burner end normally is below 1400°F.

   (2)   If the kiln purge is not complete, the PLC drives the kiln combustion-air valve and shroud-air dampers open. The DFS BMS kiln-purge timer starts *when all kiln purge permissive conditions are met, the system purge is complete, and* minimum purge airflow is established *(see FAWB Note B-25)*. The combustion-air valve is driven to low-fire position and the shroud-air dampers are driven to their setpoint when the kiln purge time is complete.

(F)   The Fireye verifies the combustion-air and fuel-gas valves are at low-fire position.

(G)   The Fireye energizes the burner igniter, opens the pilot fuel gas for pilot ignition trial, and proves flame presence within 10 seconds by means of the flame scanner. If the flame is not verified, burner lockout occurs.

(H)   If the pilot light is verified, the Fireye energizes the main fuel-gas safety-shutoff valves for main burner ignition trial. After 10 seconds, the Fireye closes the pilot

fuel-gas valve, de-energizes the igniter, and continues to scan the flame. If flame is lost at any time, burner lockout occurs.

(I)   The Fireye signals the PLC to resume control of the air- and fuel-control valves in automatic mode *(see FAWB Note B-16)*.

3.3.6   Loss of Power

Loss of power is a significant concern in the operation of this system since agent vapors could be evolving in the kiln at the time power is lost. The system is designed to maintain normal operating temperature in the afterburner for a period sufficient to destroy all agent volatilized in the kiln. To accomplish this, one burner is relit in the afterburner, as described below:

(A)   In the event of power loss, the following conditions exist almost immediately:

  (1)   All process control systems, including the afterburner BMS, that are on Uninterruptible Power Supply (UPS) continue to function.

  (2)   Power is interrupted to the DFS drive, lube-oil pumps, HDC heaters and drive, combustion-air blowers, and all PAS blowers and pumps. All burners shutdown, fuel-shutoff valves close, combustion-air valves close to low-fire stops, and shroud-air dampers close.

  (3)   A Loss of Power DICO is sent from the power controller to the DFS controller, which then drives all valves to the safe position and stops feed.

  (4)   Draft to the furnace is maintained for a limited time by the momentum of the spinning induced draft blower.

(B)   The emergency diesel generator (EDG) is started to provide essential power. The following sequence is initiated after essential power is established, and the DFS controller receives a Power Restored DICO from the power controller that defines t=0 seconds:

  (1)   At t=0 seconds at TOCDF, the PLC starts the DFS emergency exhaust blower (see programmatic process FAWB 28, Liquid Incinerator [LIC], DFS, and Metal Parts Furnace [MPF] PAS and PFS). The TOCDF emergency exhaust blower starts and aligns *to maintain furnace draft.* At all other sites, the PLC restarts one stage of the adjustable-speed drive (ASD) ID fan.

  (2)   At t=5 seconds, the DFS controller starts the afterburner, combustion-air blower. After this blower is running, relighting a burner in the afterburner is the operator's decision. Relight should be attempted only if munitions processing was interrupted in order to maintain safe processing of residual gases. If this is the case, the afterburner should already be at a temperature well above 1400°F, making a purge unnecessary for relight (see Section 3.3.5 [D] above).

  (3)   At t=10 seconds, the DFS controller starts the kiln lube-oil system, rotary-kiln drive in the oscillating mode, and the quench-brine pump in the DFS PAS.

(4)   The HDC remains shut down.

(C)   The kiln continues to oscillate and the afterburner continues to operate with one burner until all residual agent is destroyed. At this point, the furnace can be shut down, as described below in Section 3.3.7, Normal Shutdown.

3.3.7   Normal Shutdown

After munitions processing is complete (i.e., rotary kiln and HDC are empty), the operator can completely shut down the furnace by the following procedure:

(A)   The CRO inputs a setpoint of 0°F *in the kiln* temperature controllers, *16-TIC-020/182,* and the HDC heater temperature controllers. The controllers ramp the temperature down at the same rate used for heatup in order to minimize thermal stress to the components. When the HDC temperature falls below 1000°F, the DFS controller shuts down the HDC drive and oscillates the kiln. If no material is present on the HDC, the operator manually restarts the HDC drive to prevent uneven cooling of the conveyor *and places the kiln drive in FORWARD. When the HDC cools below 200°F, the operator stops the HDC conveyor and closes the HDC discharge gates.*

(B)   After *16-TIC-020* drops below *500°F*, the operator shuts off the *kiln* burner. The combustion-air valve is automatically driven to the low-fire position when the burner is off, and the combustion-air blower continues to run to provide cooling flow through the system.

(C)   When the *kiln* has cooled to *below 200°F*, the *kiln* combustion-air blower *is* placed in manual and turned off. *The kiln drive and kiln lube oil system can also be stopped after the kiln temperature is below 200°F.*

(D)   The CRO verifies a setpoint of –1.5 in. wc. in DFS afterburner pressure controller, 16-PIC-065. An outside operator unlocks the kiln exhaust isolation valve, 16-XV-862, and the AFB air intake valve, 16-HV-863, and unlocks and opens the instrument air supply valves to each. The CRO then closes 16-VX-862 (ID fan inlet damper control automatically shifts from 16-PIC-018 to 16-PIC-065 when 16-XV-862 starts to close). When 16-XV-862 begins to close, 16-HV-863 begins to open (see FAWB Note B-21). After the CRO verifies that 16-XV-862 is closed and 16-HV-863 is open, the outside operator locks closed 16-XV-862. See FAWB Note B-20 for 16-XV-862 operation at ANCDF.

(E)   The CRO enters a setpoint of 0°F in the DFS afterburner temperature controller, 16-TIC-092. The controller ramps the temperature down at 150°F/hr until the temperature reaches 1200°F. Below 1200°F, the ramp rate is reduced to 100°F/hr.

(F)   When 16-TIC-092 drops below 1200°F, the operator shuts off the afterburner burners. The combustion-air valves are automatically driven to low-fire position when the burners are off, and the combustion-air blowers continue to run to provide cooling flow through the system.

(G)   When the afterburner has cooled to below 200°F, the afterburner combustion-air blower is placed in manual and turned off.

(H)   Shutdown is completed by closing all block valves for fuel gas, instrument air, process water, plant air, secondary cooling water, hydraulics, decon, and lube oil.

3.3.8 Emergency Shutdown

The CON operator can initiate a DFS emergency shutdown by pushing the emergency stop (E-stop) button on any one of six CON consoles[8]. Emergency shutdown activation de-energizes power to the DFS BMS; stops all drive motors, blowers, and pumps in the DFS; drives all valves to the safe position; and stops feed. At TOCDF, which does not have a PFS (see FAWB Note B-4), depressing the CON E-stop also stops all pumps in the DFS PAS. At ANCDF, PBCDF, and UMCDF, which have a PFS, after depressing the CON E-stop, one stage of the ID fan remains running along at reduced speed to provide furnace draft (Stage 2 of the ID fan is shutdown after depressing the CON E-stop if Stage 1 is running). In addition, the quench brine pump, clean liquor pump, clean liquor air coolers, and gas reheater are not shutdown from the CON E-stop.

An operator can initiate a DFS kiln emergency shutdown by pushing the E-stop on the BMS panel. The BMS E-stop shuts down the kiln burner, stops feed, shuts down the retort combustion-air blower, and oscillates the kiln. An outside operator also can initiate an emergency shutdown of the DFS slagging afterburner by pushing the E-stop on the DFS afterburner BMS panel. The DFS afterburner BMS E-stop shuts down both afterburner burners, stops feed, shuts down the DFS afterburner combustion-air blower, and oscillates the kiln.

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[8] The ANCDF and UMCDF designs, and the TOCDF site, have six CON console E-stops. The PBCDF design currently shows only four CON console E-stops, however, the DSIC is preparing an ECP to add a fifth that is located on ICS-CONS-108.

SECTION 4
COMPONENT SUMMARY

4.1   DFS COMPONENTS

The DFS components presented are grouped into three subsystems: the rotary kiln, afterburner and heated discharge conveyor systems.

4.1.1   Rotary Kiln Components

The primary components of the DFS retort (i.e., rotary kiln) [DFS-FURN-101] are the furnace chamber, combustion air blower, gearbox and trunnion bearing lube oil systems, automatic control and block valves, and associated process instrumentation. Design parameters associated with the combustion air blowers are listed in Table 4.1. Power source information is listed in Table 4.3.

Table 4.1   DFS Retort Combustion Air Blower Design Parameters

	ANCDF	PBCDF	TOCDF	UMCDF
Quantity	1	1	1	1
Tag #	DFS-BLOW-101	DFS-BLOW-101	DFS-BLOW-101	DFS-BLOW-101
Blower Type	Motor-driven centrifugal	Motor-driven centrifugal	Motor-driven centrifugal	Motor-driven centrifugal
Rated Flow/ Δ Pressure [a]	2018 acfm 35 in. wc.	1230 scfm 45 in. wc.	1475 scfm 56 in. wc.	1220 scfm 45 in. wc.
Motor Power	40 hp	40 hp	40 hp	30 hp[b]
P&ID	AN-1-D-533	PB-1-D-533	TE-1-D-533	UM-1-D-533

[a] At local operating conditions.
[b] Referenced design documentation shows a 30-hp rating at UMCDF; however, the UMCDF blower will have a 40-hp rating (see FAWB Note B-13).

4.1.2   DFS Slagging Afterburner Components

The primary components of the DFS slagging afterburner (DFS-FURN-102) are the furnace chamber, the secondary combustion air blower, automatic control and block valves, and associated process instrumentation. Design parameters associated with the combustion air blowers are listed in Table 4.2. Power source information is listed in Table 4.3.

Table 4.2   DFS Secondary Combustion Air Blower Design Parameters

	ANCDF	PBCDF	TOCDF	UMCDF
Quantity	1	1	1	1
Tag #	DFS-BLOW-102	DFS-BLOW-102	DFS-BLOW-102	DFS-BLOW-102
Blower Type	Motor-driven centrifugal	Motor-driven centrifugal	Motor-driven centrifugal	Motor-driven centrifugal
Rated Flow/ Δ Pressure[a]	7372 acfm 24 in. wc.	6500 scfm 45 in. wc.	8779 scfm 27.6 in. wc.	6400 scfm 39 in. wc.
Motor Power	75 hp	75 hp	75 hp	100 hp[b]
P&ID	AN-6-D-509	PB-6-D-509	TE-6-D-509	UM-6-D-509

[a] At local operating conditions.
[b] Referenced design documentation shows a 100-hp rating at UMCDF; however, the UMCDF blower will
have a 75-hp rating (see FAWB Note B-13).

4.1.3   DFS Heated Scrap Discharge Conveyor Components

The primary components of DFS HDC are the powered conveyor, electrically-heated enclosure, slide gates, expansion joint chute, waste bins, waste bin dolly, waste bin pull winch[1], blast enclosure door and associated instrumentation. Power source information is listed in Table 4.3.

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[1] Waste bin pull winch was removed from TOCDF, *and is being removed at ANCDF and UMCDF (see FAWB Note B-24).*

4.2 EQUIPMENT POWER SOURCES

Table 4.3 lists the equipment power sources for the major equipment used in the DFS based on *site drawing revisions listed in Appendix H.* Power sources are characterized as either critical, essential or utility. Critical loads are powered by the UPS panelboards and do not experience an interruption in power if offsite power is lost. Essential loads are required for safe shutdown of the facility, but can tolerate an interruption in power while being loaded on an onsite emergency diesel generator (EDG). Utility loads are not required if offsite power is lost and are not powered by the onsite EDG. Only motive power sources are listed in the table; instrumentation and control power sources are not listed. In addition, hydraulically and pneumatically powered, and non-powered equipment are not included in the table.

Table 4.3   DFS Equipment Power Sources

Equipment Tag	Description	Site(s)	Power Source	Power Type
DFS-BLOW-101	Retort Combustion Air Blower	AN/TE/UM	SPS-MCC-108	Utility
		PB	SPS-MCC-105	
DFS-BLOW-102	DFS Secondary Combustion Air Blower	AN/PB/TE/UM	SPS-MCC-111	Essential
DFS-CNVX-101	DFS Heated Scrap Discharge Conveyor With Chute & Gate	AN/TE/UM	SPS-MCC-108	Utility
		PB	SPS-MCC-105	
DFS-CNVX-101A1	DFS Heated Scrap Discharge Conveyor Heater 1	AN/TE/UM	SPS-MCC-108	Utility
		PB[a]	SPS-MCC-105	
DFS-CNVX-101A2	DFS Heated Scrap Discharge Conveyor Heater 2	AN/TE/UM	SPS-MCC-108	Utility
		PB[a]	SPS-MCC-105	
DFS-CRAN-101	HDC Jib Crane	TE	SPS-PANB-123	Utility
DFS-CRAN-401	Crane w/ Hoist	AN/TE/UM	SPS-PANB-404	Utility
		PB	SPS-MCC-105	
DFS-CRAN-402	DFS End Housing Jib Crane	AN/PB/UM	SPS-PANB-404	Utility
DFS-FURN-101	DFS Retort, Kiln Drive Motor (A)	AN/PB/TE/UM	SPS-MCC-102	Essential
DFS-FURN-101	DFS Retort, Lube Oil Pump Motor (B)	AN/PB/TE/UM	SPS-MCC-102	Essential
DFS-FURN-101	DFS Retort, Lube Oil Pump Motor (C)	AN/PB/TE/UM	SPS-MCC-102	Essential

Table 4.3   (Cont'd)

Equipment Tag	Description	Site(s)	Power Source	Power Type
DFS-FURN-101	DFS Retort, Thrust Roller Blower Motor (D)	AN/PB/TE/UM	SPS-MCC-102	Essential
DFS-WNCH-101	Waste Bin Pull Winch[c]	AN/UM	SPS-MCC-108	Utility
		PB	SPS-MCC-105	

[a] Not listed in PBCDF Master Equipment List.

[b] *Deleted.*

[c] Waste Bin Pull Winch was removed from TOCDF *and is being removed at ANCDF and UMCDF (see FAWB Note B-24).*

APPENDIX A

Acronyms and Abbreviations

The acronyms and abbreviations listed below are common for all of the programmatic process FAWBs:

A&I	alarm and interlock matrix
AASS	automatic agent sampling system
ABCDF	Aberdeen Chemical Agent Disposal Facility
AC	alternating current
ACAMS	automatic continuous air monitoring system
acfm	actual cubic foot per minute
ACS	agent collection system
ACSWS	acid and caustic storage and wash system
ADC	air dilution controller
AgF	silver fluoride
AHT	agent holding tank
AHU	air handling unit
AMC	Army Materiel Command
ANAD	Anniston Army Depot (Alabama)
ANCDF	Anniston Chemical Agent Disposal Facility
ANSI	American National Standards Institute
AQS	agent quantification system
AR	Army Regulation
ASA	automatic submerged arc
ASC	allowable stack concentration
ASD	adjustable-speed drive
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	acid wash system
AWFCO	automatic waste feed cutoff
BCHS	bulk container handling system
BCS	bulk chemical storage
BDS	bulk drain station
BGCDF	Blue Grass Chemical Agent Disposal Facility
BLAD	blast load attenuation duct
BMS	burner management system
BPS	burster punch station (MIN)
BRA	brine reduction area
BRS	burster removal station (PMD)
BSA	buffer storage area
BSR	burster size reduction machine
Btu	British thermal unit
°C	degrees Celsius
CAMDS	Chemical Agent Munition Disposal System
CAB	combustion air blower

CAL	chemical assessment laboratory
CAS	compressed air system
CBR	chemical, biological, and radiologic al (filter)
CCB	configuration control board
CCS	central control system
CCTV	closed-circuit television
CDS	central decontamination supply
CDSS	central decontamination supply system
CDTF	Chemical Demilitarization Training Facility
CEHNC	U.S. Army Engineering & Support Center, Huntsville.
CEMS	continuous emission monitoring system
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHB	container handling building
CHWS	chilled water supply
CO	carbon monoxide (monitors/analyzers)
COM	communications system
CON	control room
COR	munitions corridor
CPA	client-Parsons authorization
CRO	control room operator
CRT	cathode ray tube
CS	crimp station (PMD)
CSS	campaign select screen
CSD	Chemical Stockpile Disposal (Project)
CV	control variable
CWC	Chemical Weapons Convention
CWS	chilled water supply
DAAMS	depot area air monitoring system
db	dry bulb
DC	direct current
DCD	Deseret Chemical Depot
DDESB	Department of Defense Explosives Safety Board
decon	decontamination (solution)
demil	demilitarization
DFS	deactivation furnace system
DICI	digital intercontroller communication input
DICO	digital intercontroller communication output
DMS	door monitoring system
DPE	demilitarization protective ensemble (suit)
DSA	DPE support area
dscf	dry standard cubic foot
DSIC	design and systems integration contractor
DUN	dunnage incinerator
E&M	engineering and maintenance
E-stop	emergency stop
EAC	equipment acquisition contractor
ECF	entry control facility
ECP	engineering change proposal
ECL	engineering control level
ECR	explosive containment room

ECV	explosive containment vestibule
EDG	emergency diesel generator
EHM	equipment hydraulic module
EIC	equipment installation contractor
EPS	emergency power system
ETL	extreme temperature limit
°F	degrees Fahrenheit
FAWB	functional analysis workbook
FDLL	field design lessons learned (program)
FDPS	fire detection and prevention system
FEET	FAWB evolvement/evaluation team
FEM	fire extinguishing medium
FIFO	first-in-first-out
FIL	activated carbon and HEPA filter
FPD	flame photometric detector
fpm	feet per minute
FSSS	flame safety shutdown system
ft	feet
GA	general arrangement; nerve agent ethyl N-dimethylphosphoramidocyanidate ($C_5H_{11}N_2O_2P$)
gal	gallon
GB	nerve agent Sarin, isopropyl methyl phosphonofluoridate ($C_4H_{10}FO_2P$)
GC	gas chromatograph
GEN	emergency generator
GFE	government-furnished equipment
GLD	gross level detector
GPD	gas plasma display
gpm	gallons per minute
gr	grain
H	blister agent mustard, made by the Levinstein process, Bis(2-chloroethyl) sulfide or 2,2'-dichlorodiethyl sulfide ($C_4H_8Cl_2S_{1.5}$ [empirical formula])
H_3PO_4	orthophosphoric acid
HCl	hydrochloric acid
HD	blister agent distilled mustard, Bis(2-chloroethyl) sulfide or 2,2'-dichlorodiethyl sulfide ($C_4H_8Cl_2S$)
HDC	heated discharge conveyor
HDV	hydraulic directional control valve
HEPA	high-efficiency particulate air (filter)
HLE	high-level exposure
HOA	hand-off-auto
hp	horsepower
hr	hour
HRA	health risk assessment
HT	60% by weight blister agent distilled mustard and 40% agent T [Bis[2(2-chloroethylthio)ethyl] ether]
HVAC	heating, ventilating, and air-conditioning
HVC	heating, ventilating, and cooling
HYD	hydraulic power
HYPU	hydraulic power unit
HYVM	hydraulic control valve manifold
I/O	input/output

I-lock	interlock
IAS	instrument air system
icfm	inlet cubic foot per minute (acfm at the inlet)
ICS	instrumentation and control system
ID	induced draft
	inside diameter
IDLH	immediately dangerous to life and health
IGS	inertial gas sampling
in.	inch
in. wc.	inches water column
IR	infrared
ISO	International Standards Organization
JACADS	Johnston Atoll Chemical Agent Disposal System
kW	kilowatt
L	Lewisite (blister agent)
LAB	laboratory
lb	pound
lb/hr	pounds per hour
LCO	limiting condition of operation
ln	line
LIC	liquid incinerator
LIFO	last-in-first-out
LIT	level-indicating transmitter
LOQ	limit of quantification
LOR	local-off-remote
LPG	liquefied petroleum gas
LQCP	laboratory quality control plan
LR	local-remote
LSB	LSS bottle filling system
LSS	life support system
LVS	low volume sampler
mA	milliamperes
MCC	motor control center
MCP	monitoring concept plan
MDB	munitions demilitarization building
MDM	multipurpose demilitarization machine
MEL	master equipment list
MER	mechanical equipment room
mg/m^3	milligrams per cubic meter
MIG	mine glovebox
MIN	mine machine
MMS	mine and munitions system
MPB	munitions processing bay
MPF	metal parts furnace
MPL	multiposition loader
	maximum permissible limit (for DPE)
MPRS	miscellaneous parts removal station (PMD)
MSB	monitor support building
MSS	munition sampling system
NaOCl	sodium hypochlorite
NaOH	sodium hydroxide

NCRS	nose closure removal station (PMD)
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NG	natural gas
NRT	near real time
O&M	operations and maintenance
OBV	observation corridor
ONC	onsite container
OS	orientation station (MIN)
OSHA	Occupational Safety and Health Administration
OVT	operational verification testing
P&A	precision and accuracy
P&ID	piping and instrument diagram
PA	public address
PAS	pollution abatement system
PBA	Pine Bluff Arsenal
PBCDF	Pine Bluff Chemical Agent Disposal Facility
PCS	primary cooling system
PCT	preconcentrator tube
PDAR(S)	process data acquisition and recording system
PDE	projectile deformation equipment
PDIT	pressure differential indicator transmitter
PDS	pull and drain station (MDM)
	punch and drain station (MIN)
PFD	process flow diagram
PFS	PAS filter system
pH	potential of hydrogen (a measure of acidity or alkalinity)
PHS	projectile handling system
PID	proportional integral derivative
pig	overpacked shipping container
PKPL	pick-and-place machine (also PPL)
PLA	plant air system
PLC	programmable logic controller
PLL	programmatic lessons learned (program)
PLS	proximity limit sensor/switch
PMB	personnel and maintenance building
PMCD	Program Manager for Chemical Demilitarization (formerly PEO-PM Cml Demil)
PMCSD	Project Manager for Chemical Stockpile Disposal
PMD	projectile/mortar disassembly (machine)
PML	personnel, maintenance, and laundry (complex or building)
POT	potable water
PPL	pick-and-place machine
PPS	primary power system
PQAP	Participant Quality Assurance Plan
PRW	process water
PSB	process support building
psig	pounds per square inch, gauge
PSV	pressure safety valve
PUB	process and utility building
PUDA	Pueblo Depot Activity (Colorado)

PWR	power systems (unit substation, uninterruptible power supply, battery rooms, and emergency generator)
RCRA	Resource Conservation and Recovery Act
RDS	rocket drain station
RDTE	research, development, testing, and evaluation
RFI	Request for Information
RHA	residue handling area
RHS	rocket handling system
rpm	revolutions per minute
rps	revolutions per second
RSM	rocket shear machine
RSS	rocket shear station
SC	systems contractor
SCBA	self-contained breathing apparatus
scf	standard cubic foot
scfh	standard cubic feet per hour
scfm	standard cubic feet per minute
SCW	secondary cooling water
SCT	systems contractor for training
SDS	spent decon system
sg	specific gravity
SGS	steam generation system
SOP	standing operating procedure
SPS	secondary power system
SRS	slag removal system
TBD	to be determined
TCE	treaty compliance equipment
TEAD	Tooele Army Depot (Utah)
TIP	tray information packet
TM	Army Technical Manual
TMA	toxic maintenance area
TNT	trinitrotoluene (explosive)
TOCDF	Tooele Chemical Agent Disposal Facility
TOX	toxic cubicle
TSCA	Toxic Substances Control Act
TSHS	toxic storage and handling system
TSO	Tight shutoff
TWA	time-weighted average
UE&C	United Engineers and Constructors
UMCDF	Umatilla Chemical Agent Disposal Facility
UPA	unpack area
UPS	uninterruptible power supply
UV	ultraviolet
VCR	video cassette recorder
VX	nerve agent, O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothiolate ($C_{11}H_{26}NO_2PS$)
wc	water column
WTS	water treatment system
XXX	3X level of decontamination
XXXXX	5X level of decontamination (minimum of 1000°F for 15 minutes)
Z	general designation for monitoring hazard level

APPENDIX B

FAWB Notes

Appendix B contains notes to expand upon the descriptions contained in the text of the FAWB.
The notes include related experiences at TOCDF and the Johnston Atoll Chemical Agent
Disposal System (JACADS).

B-1   Per discussions held during the comment resolution matrix meeting for the HVAC
       FAWB on 9-10-98, the programmatic process FAWBs are being prepared under the
       assumption that the DUN, DUN PAS and DUN PFS (at ANCDF) systems will not be
       used for processing at *any of the four sites. Therefore, a* programmatic process
       FAWB for the DUN/DUN PAS/PFS is not being developed. Handling and disposal of
       dunnage are considered site-specific activities that have not yet been determined.
       PBCDF deleted the DUN from the design by PBAC1000DUN. The DUN is
       installed at TOCDF and remains in the design at ANCDF. *The RCRA and design
       package for the UMCDF DUN, DUN PAS, and DUN PFS were incorporated
       under post-construction design update package PC2.*

B-2   Per discussions held during the comment resolution matrix meeting for the PAS FAWB
       on 11-10-98, the programmatic process FAWBs for the PAS and PFS were combined
       into a single PAS/PFS FAWB that applies to all four sites. *Since TOCDF will not
       have a PFS, discussions related to the PFS are applicable to ANCDF, PBCDF
       and UMCDF only (see FAWB Note B-4 below).*

B-3   The acid/caustic storage and wash system is no longer used at TOCDF and has been
       removed from the ANCDF, UMCDF, and PBCDF site designs by ECPs
       ANAC343PAS, R1, UMAC160PAS, R1, and PBAC340PAS, respectively.

B-4   The PFS was incorporated into the ANCDF, PBCDF, and UMCDF designs under
       ECPs ANAC459PAS, PBAC406PAS and UMAC0193PAS, respectively. TOCDF
       will not have a PFS. *Since the DUN PFS is unique to the DUN, it is considered
       part of the DUN system (see FAWB Note B-1).*

B-5   Under ECPs ANAC312SRL (ANCDF), PBAC327SRL (PBCDF), and
       UMAC144SRL (UMCDF), a spray nozzle positioned directly over the RSM/BSR &
       MIN discharge blast gate (MMS-GATE-103, -104) was added to follow-on site
       designs that supplies process water to quench smoldering feed and wash propellant into
       the chute. Under ECP TEMP-1505-RSM, TOCDF added a similar system, except
       that the flow to the spray nozzles is taken from the supply line to the shear spray (i.e.,
       decon or water). *TOCDF automated control of the gate spray system under ECP*

TEMP-2625-DFS R1. TOCDF has also issued TEMP-2670-DFS to install additional sprays and a spring-loaded wiper on the slide gate housing to provide additional cleaning of the slide gate and upper feed chute. The gate spray system was added at all sites to incorporate a JACADS lessons-learned item (LL 1298). To prevent excessive water flow into the furnace, the follow-on site designs include a stop feed, initiated by 03-FAH-178, whenever the combined flow of both *gate spray* systems and both DFS feed chute sprays (sum of 4 flow rates) exceeds 3 gpm. *At the Jan 2001 ANCDF DFS review meeting, ANCDF decided to have a 60-sec time delay for this alarm.*

B-6   At TOCDF, the kiln burner end temperature controller (16-TIC-020) setpoint is 1100ºF for rockets and 1050ºF for all other munitions. The DFS afterburner temperature controller (16-TIC-092) setpoint is 2150ºF for all munitions. *At the Jan 2001 ANCDF DFS review meeting, ANCDF stated that they will run the kiln with the same operational control setpoints as TOCDF, but they will run the afterburner at 2000ºF for all munitions. UMCDF has stated that they will run the DFS afterburner at 2200ºF for rockets and 2000ºF for all other munitions. Note that the design documentation for the follow-on sites may not match these values. It is planned to have an operational configuration similar to TOCDF implemented at PBCDF.*

B-7   At TOCDF, the kiln rotation speed is set at 1.70 to 1.80 rpm for rocket processing to achieve desired throughput rate. For all other munitions, the speed is set at 1 rpm, which is sufficient to meet desired throughput rates. The design documentation for the follow-on sites may not match the TOCDF kiln speed for rocket processing; however, it is planned to have the operational configuration at TOCDF implemented at the follow-on sites.

CH 2   B-8   Kiln exhaust temperature controller 16-TIC-182 is not shown in the UMCDF or PBCDF designs used to prepare this FAWB. TOCDF ECP TEMP-1941-DFS, R1

CH 2   *and ANCDF AN-1115-ECP (ANWP1648PLC)* added 16-TIC-182 and changed the furnace temperature control logic. The controller was added to ensure that the feed end of the kiln (the exhaust) is maintained above the minimum required discharge temperature of 950ºF prior to munition feed. The FDLL direction for the follow-on sites was to incorporate these changes by implementation of TOCDF software. This change has not yet been approved for incorporation into the design

CH 2   and permit documentation for the follow-on sites.   It is planned to have the operational configuration at TOCDF implemented at the *other* follow-on sites.

B-9   At TOCDF, ECP TEMP-2302-DFS eliminated the dual temperature elements from the four operating furnaces (2 LICs, DFS, and MPF) because the spare element was

typically failed or near the point of failure when the primary element failed. Thus, the spare provided little or no benefit. In addition, on the DFS, which uses Type K thermocouples, using a single element thermocouple allows for use of larger diameter element which provides for a thermocouple configuration with a longer life expectancy. *ANCDF and UMCDF have issued ECPs ANWP1356DFS and UMSF0765DFS, respectively, to change the dual-element thermocouples to single-element ones. ANCDF plans to replace the existing dual element thermocouples during normal routine change-out. UMCDF plans to change them out during systemization. PBCDF will be preparing an ECP to implement a similar change.*

B-10   Under JACADS ECP DFSS-0108, JACADS replaced the feed chute temperature control spray nozzle with a nozzle that also serves to wash the face of the DFS feed blast gates (DFS-GATE-101/102). The modification was made to minimize accumulation of explosive residue on the gate face and gate-seating surface. The spray is activated automatically each time the gate is cycled. *The ECP was presented at a PLL ECP review meeting. UMCDF has incorporated the change under UMSF0699DFS. ANCDF and PBCDF are reviewing the change for incorporation. TOCDF installed a high-pressure spray system (see FAWB Note B-22).*

B-11   JACADS temporarily used decon as the spray solution between the DFS feed gates to reduce the amount of agent in the feed chutes. This practice was discontinued due to the formation of crystallized glass on the kicker chute.

B-12   At TOCDF, the kiln exhaust gas temperature controller for quench spray (16-TIC-008) has a setpoint of 1525ºF for all munitions. The design documentation for the follow-on sites may not match the TOCDF setpoint; however, it is planned to have the operational configuration at TOCDF implemented at the follow-on sites.

B-13   The DSIC reviewed the vendor documents for the DFS retort combustion air blowers and found that the vendor documents show a 40-hp motor for ANCDF, PBCDF, and UMCDF. In addition, the vendor documents for the DFS secondary combustion air blowers show a 75-hp motor for the three sites. The UMCDF design documentation has not yet been revised to match the vendor documentation.

B-14   The malfunction alarms for MMS-GATE-103 and -104 (03-XA-131 and –231) are not shown on the P&IDs for TOCDF or the follow-on sites. The alarms exist in the PLC code at TOCDF and will exist at follow-on sites by implementation of the TOCDF software. Malfunction of MMS-GATE-103 is indicated on Advisor PC screens RDA and DFM, and malfunction of MMS-GATE-104 is indicated on Advisor PC screens RDB and DFM.

B-15   *Deleted.*

B-16   *Under ECP TEMP-2540-DFS R1, TOCDF modified the control system response to a significant drop in kiln or afterburner temperature. If the temperature drops more than 200°F below the operating setpoint, the PLC ramps temperature back to the operating setpoint using the built-in ramp function (100°F per hour). The operator, however, has the option to take MANUAL control and increase the temperature at a faster rate. Use of the built-in ramp rate prevents overshoot of the operating setpoint temperature that previously occurred when the temperature control loop was simply returned to AUTO.*

B-17   *At the January 2001 ANCDF DFS review meeting, the kiln operating pressure relative to the ECR room pressure was discussed. At TOCDF, the kiln operating pressure is –0.75 in. wc., the DFS room pressure is –0.75 in. wc., and the ECR is –1.8 in. wc. Thus, the kiln operates 0.3 in. wc. more positive than the ECRs. ANCDF stated that they plan to operate the kiln at –0.5 in. wc. At this pressure, the kiln will operate at a higher pressure than the ECRs. If PBCDF and UMCDF operate with a similar kiln pressure, they too will operate with the kiln pressure higher than the ECR pressure. The DSIC recommends that the kiln operating pressure be reduced to be lower than the ECR room pressure, which is how JACADS operated. According to PLL Issue 15-34, the JACADS configuration was modified to have the kiln maintained at a lower pressure than the ECRs after the GB rocket fire in the ECR.*

B-18   *Design documentation for ANCDF, PBCDF, and UMCDF indicates that there are two modes of automatic operation for furnace pressure control: 1) modulating the ID fan speed with the ID fan inlet damper at a preset position, or 2) modulating the ID fan inlet damper position with the ID fan at a preset speed. After discussions with the DSIC and EIC, it was decided that since speed control of the ID fans is the desired pressure control mode, furnace pressure control by modulating the ID fan inlet damper position would not be available as an automatic control mode (see RFI S-ALL-216). If furnace pressure control in this mode is desired, the operator can place the system in MANUAL, set the ID fan speed, and manually position the ID fan inlet damper to maintain the desired primary chamber pressure.*

B-19   *At TOCDF, TEMP-2570-DFS added wide range pressure transmitter, PDIT-018A, in parallel with PDIT-018 to alert the operator when the primary chamber pressure is beyond the range of PDIT-018. PDIT-018A range is +10 in wc to –40 in wc. Excessive-negative-pressure alarms are provided at –8 in wc and –10 in wc that must be acknowledged by a CON supervisor and reset by a controls engineer. At –8.0 in wc, if 16-PIC-018 is in MANUAL, the PLC drives the ID fan damper to 26% CV and drives the venturi scrubber to 66% CV. After 5 seconds, the venturi controller controls in AUTO at 30.0 in. wc. At –10 in wc, the PLC*

shuts down both stages of the ID fan if both of the afterburner burners are not released to AUTO by the BMS. Thus, if either of the afterburner burners is released to AUTO (i.e., the burner is on main flame), the ID fan will not shutdown even if the furnace pressure decrease below –10 in wc. This ECP was presented at a PLL ECP review meeting in November 2000, and is under review at follow-on sites.

B-20 *At the Jan 2001 ANCDF DFS review meeting, ANCDF stated that they will use the following pressure control scheme based on the position of 16-XV-862: (1) When opening XV-862 from the fully closed position, switch furnace pressure control from PIC-065 to PIC-018 after XV-862 no longer indicates closed and PIT-018 < -0.5 in. wc. The initial controller setpoint will be the PV from PIT-018. When XV-862 is fully open, the CRO can enter the desired setpoint, (2) When closing XV-862 from the fully open position, switch furnace pressure control from PIC-018 to PIC-065 after XV-862 no longer indicates open. The initial controller setpoint will be the PV from PIT-065. UMCDF has stated that they plan to use the same control scheme.*

B-21 *At TOCDF, the PLC automatically positions HV-863 depending on the plant conditions. Upon initial startup of the ID fan with the isolation valve, XV-862, closed, the air intake valve, HV-863, is set to 60% open. When the isolation valve is first closed during system shutdown, the air intake valve is set to 50% open. With one stage of the main ID fan running, the air intake valve is set to: 1) 10% during system purge, 2) 90% when not purging and no burner is lit, and 3) 50% when at least one of the AFB burners is lit. With both stages of the main ID fan running the air intake valve is set to: 1) 55% during system purge, 2) 80% when not purging and no burner is lit, and 3) 45% when at least one of the AFB burners is lit. If the main ID fan is not running and the emergency ID fan is running, the air intake valve is set to 30% open. If none of the ID fans are running, the air intake valve is set to 0% open.*

B-22 *Under ECP TEMP-2678-RSM, TOCDF modified the RSM sequencer code to prevent the RSM from automatically shearing rockets until the DFS tipping valve has cycled following the previous shearing steps. This prevents rockets pieces from being automatically sheared and dropped onto the MMS slide gate until the slide gate and the tipping valve have cycled. The ECP was presented at a PLL ECP review meeting in May 2001, and is under review by ANCDF, PBCDF, and UMCDF.*

B-23 *Under ECP TEMP-2579-DFS, TOCDF added a high pressure spray system to clean debris or residue from the tipping gates (DFS-GATE-101/102). The spray is controlled by a local operator in the MER and is used at the request of the shift*

supervisor. See FAWB Note B-10 for DFS chute spray modifications at other sites.

B-24   *Under ECP TEMP-1725-LSS, TOCDF modified the HDC bin changeout equipment and procedure, which included removing the waste bin pull winch, DFS-WNCH-101. Similar modifications are being made at ANCDF and UMCDF by ECPs ANWF988MDB and UMSF892HDC, respectively. Referenced versions of the P&IDs and electrical single line diagrams, however, still show DFS-WNCH-101 at ANCDF and UMCDF. Removal of DFS-WNCH-101 and the revised bin changeout procedure will be incorporated into a future revision to the DFS FAWB after these ECPs have been fully implemented. PBCDF is reviewing the change for applicability to their site.*

B-25   *TOCDF ECP TEMP-2561-DFS modified the DFS PAS minimum flow instrumentation and the BMS logic for DFS kiln and system purge and for lockout of DFS burners. Under the ECP, a change was made to require two out of three sensors to indicate low-low flow instead of only relying on a single input, the Kurz meter (24-FSLL-430), in the scrubber tower exhaust. Initially, a temporary change was made in which the three sensors were 24-FSLL-430, flow switch 16-FSLL-078A that measures total afterburner combustion air flow, and differential pressure switch 16-PDSLL-813 for the refractory ring venturi. A V-Cone flow element was later installed upstream of the Kurz meter. The V-Cone element has two sensors that replaced 16-FSLL-087A and 16-PDSLL-813 as inputs to the low-low flow relay. The TOCDF BMS logic now has a single relay, 16-FA-9430, to indicate low-low DFS PAS airflow. The relay is energized when any two of the three flow sensors (Kurz meter, 2 V-cone sensors) indicate low-low flow. The relay is used in the 3-P circuit for the kiln burner and both afterburner burners, and is used in the logic for the kiln purge timer and the DFS system purge timer (see Appendix D for control logic).*

APPENDIX C

Alarm and Interlock Matrices

Appendix C contains *site-specific* DFS alarm and interlock (A&I) matrix for *all four sites*. A&I matrices depict in a consolidated format the software and hardware alarms and interlocks for the equipment and instrumentation in a specific system.

Specific guidelines were developed during development of utility system FAWBs for ANCDF and UMCDF that *are* followed in the programmatic FAWBs. Fourteen specific guidelines have been established that define the format and content of entries in the A&I matrices:

1.   Analog signals from transmitters (e.g., LITs) are not listed; the alarms are indicated separately.

2.   All software prealarms and alarms (e.g., LAHs) that are indicated in the CON are listed. Setpoints and actions are shown where applicable.

3.   Equipment and instrument status indication signals (e.g., open/close, on/off) are not listed unless they initiate action.

4.   Alarms generated from GFE package units that report to the PLC are listed. If not already available and listed, the GFE internal alarms and actions will be added to the matrix when available from the site systems contractor and "*SC to provide detail*" will be entered into the "remarks" column.

5.   For field switch generated alarms, the switch tag is listed, not the alarm tag. For example, a low-low pressure alarm (PALL) generated by the field switch, 13-PSLL-008, is listed as 13-PSLL-008 rather than 13-PALL-008. The purpose for this listing is to distinguish between field switch generated hardwired alarms and alarms generated in the software based on the analog output from a transmitter.

6.   Instruments that initiate actions are listed in a vertical column sorted by prefix, loop number, instrument ID, then suffix. For example, for 99-TSH-100A, the prefix is 99, the loop number is 100, the instrument ID is TSH, and the suffix is A). Actions are listed in column across the top of the matrix and include prealarms and alarms.

7.   Setpoints are listed for all instruments where applicable. Instrument ranges for analog transmitters are shown in Appendix F. Unless otherwise noted, tank level setpoints are shown from the level transmitter tap.

8.   Only hand switches (push buttons) that cause system shutdowns are listed; other software and hardwired hand switches are not listed.

9. Local alarms are not listed.

10. Matrices are grouped by subsystem as applicable within each FAWB. For example, separate matrices are provided in the RHS FAWB for the rocket input feed assembly, the rocket drain station of the RSM, and the rocket shear station of the RSM.

11. Alarms associated with automatic actions are classified as *"alarms"* and alarms without automatic actions are classified as *"prealarms."*

12. Instruments listed in the matrix that are RCRA reportable are designated as such by entering *"RCRA"* in the Remarks column.

13. Clarifications are provided when necessary in the remarks column of the A&I matrices, or in the system and/or operator response column in alarm and system response tables.

14. Device malfunction alarms are not shown unless they initiate automatic actions such as equipment switchovers (e.g., to a standby pump), system shutdowns, or a stop feed signal.

ANCDF DEACTIVATION FURNACE SYSTEM (DFS)

ANCDF DFS ALARM AND INTERLOCK MATRIX **ANCDF DFS**

P&IDs: AN-1-D-501, -502, -531/1, -531/2, -533, AN-6-D-509, AN-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Left (B8:010)	Right (B8:011)
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SPARE
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM
	ALERT

ITM NUM	TAG NUMBER			DESCRIPTION	SET POINT	B8:010/ 17 16 15 14 13 12 11 10 07 06 05 04 03 02 01 00	B8:011/ 17 16 15 14 13 12 11 10 07 06 05 04 03 02 01 00	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
1	03	XA	131	MMS-GATE-103 MALFUNCTION	MALF	X X		See FAWB Note B-14.	0268/11	258
2	03	FAH	178	DFS GATES/CHUTES FLOW	3 gpm	X		60 s delay. Sum of water/decon flows to MMS-GATE-101/102 and MMS-CHUT-101/102 (see FAWB Note B-5). SP and delay per Jan 2001 AN DFS mtg.	**0453/16**	**134**
3	03	XA	231	MMS-GATE-104 MALFUNCTION	MALF	X X		See FAWB Note B-14.	0269/11	94
4	16	XA	001	DFS-GATE-101 MALFUNCTION	MALF	X X			0260/11	24
5	16	XA	002	DFS-GATE-102 MALFUNCTION	MALF	X X			0261/11	26
6	16	TSH	004A-J	TRUNNION & THRUST BEARING	240°F		X	5 sec delay. Alarms on high temp for any of 16-TSH-004A thru -004J	0220/00	NA
7	16	PSH	007A	HIGH ORDER DETONATION	0.5 psig	X X X X X X X X X			0220/04	28
8	16	PSH	007B	HIGH ORDER DETONATION	0.5 psig	X X X X X X X X X			0220/06	28
9	16	TAH	008	KILN EXHAUST	1625°F		X		1050/02	NA
10	16	TAHH	008	KILN EXHAUST	1650°F	X			1050/04	30
11	16	TAL	008	KILN EXHAUST	850°F		X		**1052/10**	NA
12	16	AISH	011	FUEL GAS LEAKAGE TO ROOM	25% LEL	X		Stop feed not shown on P&ID, but being added per RFI S-ALL-0239.	0220/10	214
13	16	SS	015	KILN HOME POSITION SWITCH	NA			Feed requirement for rockets.	I:110/06	NA
14	16	PAH	018	KILN PRESSURE	-0.3 in wc		X	**20 sec delay.** SP per Jan 2001 AN DFS mtg.	0450/02	230
15	16	PAL	018	KILN PRESSURE	**-2.00 in wc**		X	**20 sec delay.**	0450/00	NA
16	16	XS	019	KILN DISCHARGE CHUTE JAM	JAM	X X		10 sec delay.	0220/12	32
17	16	TAH	020	ROTARY KILN	SP + 50°F		X	SP = controller setpoint. Alarm setpoint per Jan 2001 AN DFS mtg.	0450/06	NA
18	16	TAHH	020	ROTARY KILN	1300°F	X			0450/10	34
19	16	TAL	020	ROTARY KILN	SP - 50°F		X	SP = controller setpoint. Alarm setpoint per Jan 2001 AN DFS mtg.	0450/04	NA
20	16	TALL	020	ROTARY KILN	950°F	X X			0453/06	164
21	16	FFAH	021	KILN BURNER AIR/FUEL	300%EX.AIR		X		2050/12	NA
22	16	FFAL	021	KILN BURNER AIR/FUEL	**5%EX.AIR**		X	40 sec delay.	2050/10	NA
23	16	PSLL	023	FUEL GAS SUPPLY TO KILN BURN	0.75 psig	X		**1 sec** delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/00	NA
24	16	PSHH	025	FUEL GAS SUPPLY TO KILN BURN	1.75 psig	X		**1 sec** delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/02	NA

ANCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

ANCDF DFS   **ANCDF DFS**

P&IDs: AN-1-D-501, -502, -531/1, -531/2, -533, AN-6-D-509, AN-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Left Functions	Right Functions
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SPARE
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM
	ALERT

CH 3, CH 2

ITM NUM	TAG NUMBER			DESCRIPTION	SET POINT	B8:010/ — B8:011/ (bit matrix)	ALERT	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
25	16	PAH	026	KILN BURNER PILOT GAS	1.0 psig		X		2050/00	NA
26	16	PSLL	029	KILN COMB. AIR	**5 in wc**	X		3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/04	NA
27	16	XA	040	KILN DRIVE MALFUNCTION	MALF	X X X			0266/11	36
28	16	TAH	042	DFS HEATED DISCHARGE CONV.	1200°F		X		0451/12	NA
29	16	TAHH	042	DFS HEATED DISCHARGE CONV.	1300°F	X X X			0451/14	38
30	16	TAL	042	DFS HEATED DISCHARGE CONV.	1050°F		X		0451/10	NA
31	16	TALL	042	DFS HEATED DISCHARGE CONV.	1000°F	X X		RCRA AWFCO DFS-12. SP per Jan 2001 AN DFS mtg. If in AUTO, PLC logic will S/D HDC drive at 1000°F (decreasing temp).	0451/06	40
32	16	XA	045	DFS HEATED DISCHARGE CONV.	MALF	X X X			0263/11	42
33	16	TAH	051A	KILN SKIN TEMP. #1	1450°F		X	If shroud air dampers < 50% CV, drive them to 50%.	0451/16	NA
34	16	TAHH	051A	KILN SKIN TEMP. #1	1600°F	X		RCRA AWFCO DFS-19. TSCA. Drive shroud air dampers to 100% CV.	0452/00	44
35	16	TAH	051B	KILN SKIN TEMP. #2	1450°F		X	If shroud air dampers < 50% CV, drive them to 50%.	0452/02	NA
36	16	TAHH	051B	KILN SKIN TEMP. #2	1600°F	X		RCRA AWFCO DFS-19. TSCA. Drive shroud air dampers to 100% CV.	0452/04	46
37	16	TAH	051C	KILN SKIN TEMP. #3	1450°F		X	If shroud air dampers < 50% CV, drive them to 50%.	0452/06	NA
38	16	TAHH	051C	KILN SKIN TEMP. #3	1600°F	X		RCRA AWFCO DFS-19. TSCA. Drive shroud air dampers to 100% CV.	0452/10	48
39	16	TAH	051D	KILN SKIN TEMP. #4	1450°F		X	If shroud air dampers < 50% CV, drive them to 50%.	0452/12	NA
40	16	TAHH	051D	KILN SKIN TEMP. #4	1600°F	X		RCRA AWFCO DFS-19. TSCA. Drive shroud air dampers to 100% CV.	0452/14	50
41	16	TAH	051E	KILN SKIN TEMP. #5	1450°F		X	If shroud air dampers < 50% CV, drive them to 50%.	0452/16	NA
42	16	TAHH	051E	KILN SKIN TEMP. #5	1600°F	X		RCRA AWFCO DFS-19. TSCA. Drive shroud air dampers to 100% CV.	0453/00	52
43	16	SSL	057	HDC STOPPED	0 rpm	X X		RCRA AWFCO DFS-23. 5 sec delay.	0223/12	272
44	16	XS	058	HDC UPPER GATE JAM SENSOR	JAM	X X X		RCRA AWFCO DFS-22. 10 sec delay.	0221/00	54
45	16	TSHH	062	KILN ETL	1750°F	X		BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	0420/00	NA
46	16	TSL	062	KILN 1400F RELIGHT	1400°F			Input to kiln purge bypass.	0421/04	NA
47	16	PAH	065	AB CHAMBER PRESSURE	-0.1 in wc	X		RCRA AWFCO DFS-06.	1050/16	**298**

CH 2

ANCDF DEACTIVATION FURNACE SYSTEM (DFS)

ANCDF DFS

ALARM AND INTERLOCK MATRIX

P&IDs: AN-1-D-501, -502, -531/1, -531/2, -533, AN-6-D-509, AN-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

ANCDF DFS

F-codes	P-codes
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SPARE
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM
	ALERT

ITM NUM	TAG NUMBER			DESCRIPTION	SET POINT	B8:010/	B8:011/	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
48	16	PAL	065	AB CHAMBER PRESSURE	**-7.0 in wc**		X	15 sec delay.	1050/14	NA
49	16	PSLL	068	FUEL GAS TO AB2	0.75 psig	X		BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/00	NA
50	16	PSHH	069	FUEL GAS TO AB2	2.5 psig	X		BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/02	NA
51	16	FSL	076	FEED CHUTE QUENCH FLOW	0.6 gpm		X	5 sec delay.	0420/12	NA
52	16	FFAH	078	AB#1 FUEL GAS TO CMB AIR RATIO	300%EX.AIR		X		2250/12	NA
53	16	FFAL	078	AB#1 FUEL GAS TO CMB AIR RATIO	15% EX.AIR		X	10 sec delay.	2250/10	NA
54	16	FFAH	079	AB#2 FUEL GAS TO CMB AIR RATIO	300%EX.AIR		X		2450/02	NA
55	16	FFAL	079	AB#2 FUEL GAS TO CMB AIR RATIO	15% EX.AIR		X	10 sec delay.	2450/00	NA
56	16	TAH	092	AFTERBURNER CHAMBER	SP + 100°F		X	SP per Jan 2001 AN DFS mtg.	1050/12	NA
57	16	TAHH	092	AFTERBURNER CHAMBER	**2160°F**	X		RCRA AWFCO DFS-03. SP per Jan 2001 AN DFS mtg.	1051/14	168
58	16	TAL	092	AFTERBURNER CHAMBER	SP - 100°F		X	SP per Jan 2001 AN DFS mtg.	1050/10	234
59	16	TALL	092	AFTERBURNER CHAMBER	1850°F	X		RCRA AWFCO DFS-04. SP per Jan 2001 AN DFS mtg.	1050/06	58
60	16	PSL	096	QUENCH WATER TO KILN EXHAUST	40 psig		X	5 sec delay.	1020/06	60
61	16	SALL	098	KILN SPEED	0.33 rpm	X		DSIC to add alarm to AN-1-D-531/1.	0250/06	270
62	16	IAH	099	HDC DRIVE MOTOR CURRENT	1.8 amp	X			0250/10	170
63	16	IAH	100	KILN DRIVE MOTOR CURRENT	6.5 amp	X			0250/02	172
64	16	PAL	106	AFTERBURNER COMBUSTION AIR	9 in wc		X		2250/00	NA
65	16	XA	109	KILN COMBUSTION AIR BLOWER	MALF	X		BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2060/11	NA
66	16	XA	113	AB COMBUSTION AIR BLOWER	MALF	X		BMS 3-P running interlock for AB #1 & AB #2. See 16-BSLL-850/851 for LOCKOUT interlocks.	2260/11	NA
67	16	PDISH	148	CYCLONE DELTA PRESS	2 in wc	X		5 sec delay.	1020/10	232
68	16	TAH	150	FEED CHUTE 101	260°F		X		0450/12	NA
69	16	FSL	151A-J	TRUNNION/THRUST LUBE OIL	400 cu in/min			Local alarm & input to 16-XA-153.	NA	NA
70	16	LSL	151	TRUN./THRUST LUBE OIL RESER.	8 in		X	3 sec delay.	0221/10	NA
71	16	LSLL	151	TRUN./THRUST LUBE OIL RESER.	4 in	X		3 sec delay.	0221/06	62
72	16	TSH	151	TRUN./THRUST LUBE OIL	150°F			Local alarm & input to 16-XA-153.	NA	NA
73	16	XA	153	TRUNNION L.O.S.	TROUBLE			Common trouble alarm.	0221/12	NA

CH 3
CH 2
CH 4
CH 2
CH 2
CH 3

ANCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

ANCDF DFS (left) **ANCDF DFS** (right)

P&IDs: AN-1-D-501, -502, -531/1, -531/2, -533, AN-6-D-509, AN-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Left column (F-codes, B8:010/):
- F00-SPARE
- F01-CLOSE ISOLATION VALVES (SEE NOTE 1)
- F02-SHUTDOWN KILN LUBE OIL
- F03-SHUTDOWN HEATED DISCHARGE CONVEYOR
- F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
- F05-SHUTDOWN KILN DRIVE
- F06-OSCILLATE KILN DRIVE
- F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
- F10-SHUTDOWN AFTERBURNER #2
- F11-SHUTDOWN AFTERBURNER #1
- F12-SHUTDOWN KILN COMBUSTION AIR BLOWER
- F13-SHUTDOWN KILN BURNER
- F14-CLOSE KILN SHROUD DAMPERS
- F15-OPEN KILN SHROUD DAMPERS
- F16-SPARE
- F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
- MALFUNCTION

Right column (P-codes, B8:011/):
- P17-SPARE
- P16-SPARE
- P15-SPARE
- P14-SPARE
- P13-S/D DEMISTER WATER RETURN PUMP
- P12-SWITCHOVER BRINE PUMP TO BACKUP
- P11-SWITCHOVER CL LIQ PUMP TO BACKUP
- P10-SPARE
- P07-SHUTDOWN BRINE PUMP
- P06-SHUTDOWN CLEAN LIQUOR PUMP
- P05-SPARE
- P04-SPARE
- P03-SPARE
- P02-SPARE
- P01-SHUTDOWN ID FAN 1ST STAGE
- P00-SHUTDOWN ID FAN 2ND STAGE
- PREALARM
- ALERT

(Right margin channel markers: CH 3, CH 2)

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	B8:010/ (17 16 15 14 13 12 11 10 07 06 05 04 03 02 01 00)	B8:011/ (17 16 15 14 13 12 11 10 07 06 05 04 03 02 01 00)	ALERT	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX	CH
74	16 TAH 154	FEED CHUTE 102	260°F			X		0450/14	NA	
75	16 ZS 155	BLAST DOOR 101 NOT CLOSED	N/A	X at 17				I:115/06	64	
76	16 ZS 156A/C	BLAST DOOR 101 NOT LATCHED	N/A	X at 17			Stop feed for either 16-ZS-156A or -156C not latched.	0273/13	64	
77	16 ZS 159	BLAST DOOR 102 NOT CLOSED	N/A	X at 17				I:115/13	66	
78	16 ZS 160A/C/E	BLAST DOOR 102 NOT LATCHED	N/A	X at 17			Stop feed for any of 16-ZS-160A, -160C, or -160E not latched.	0274/13	66	
79	16 PDAH 172	DECON/WATER FILTER (CHUTE 101)	10.0 in wc			**X**		0453/10	NA	CH 2
80	16 PDAH 173	DECON/WATER FILTER (CHUTE 102)	10.0 in wc			**X**		0453/12	NA	CH 2
81	16 PDAH 174	DECON/WATER FILTER (EXH DUCT)	10.0 in wc			**X**		0453/14	NA	CH 2
82	16 PSL 180	PRW TO MMS-CHUT-101	30 psig			X	3 sec delay.	0420/04	NA	
83	16 PSL 181	PRW TO MMS-CHUT-102	30 psig			X	3 sec delay.	0420/06	NA	
84	16 TAH 182	KILN EXHAUST GAS (PRE-QUENCH)	1525°F			X	SP per Jan 2001 AN DFS mtg.	1051/04	NA	
85	16 TAHH 182	KILN EXHAUST GAS (PRE-QUENCH)	**1650°F**	X at 17			RCRA AWFCO DFS-01. SP per Jan 2001 AN DFS mtg.	1051/06	70	CH 3
86	16 TALL 182	KILN EXHAUST GAS (PRE-QUENCH)	**950°F**	X at 17, X at 11			RCRA AWFCO DFS-02. Response based on Jan 2001 AN DFS mtg. SP may change based on STB results.	1051/00	68	CH 2
87	16 ZS 183	WASTE BIN OUT OF POSITION	N/A	X at 17, X at 11, X at 10			6-min delay timer.	0222/14	72	
88	16 TAH 184	HEATED DISCHARGE CONV.	1200°F			X		0451/02	NA	
89	16 TAHH 184	HEATED DISCHARGE CONV.	1300°F	X at 17, X at 11, X at 10				0451/04	76	
90	16 TAL 184	HEATED DISCHARGE CONV.	1050°F			X		0451/00	NA	
91	16 TALL 184	HEATED DISCHARGE CONV.	1000°F	X at 17, X at 11			RCRA AWFCO DFS-11. SP per Jan 2001 AN DFS mtg. If in AUTO, PLC logic will S/D HDC drive at 1000°F (decreasing temp).	0450/16	74	
92	16 PSLL 194	AB#1 FUEL GAS	0.75 psig	X at 11			3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/10	NA	
93	16 PSHH 195	AB#1 FUEL GAS	2.5 psig	X at 11			3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/12	NA	
94	16 **TSL** 197	FURN-102 KILN LIGHT PERM.	1500°F	X at 15, X at 14, X at 13, X at 06, X at 05			Kiln burner light permissive.	1020/16	78	CH 2
95	16 TSHH 197	AFTERBURNER CHAMBER (ETL)	2400°F	X at 11, X at 10			BMS 3-P running interlock for AB #1 & AB #2. See 16-BSLL-850/851 for LOCKOUT interlocks.	1020/14	NA	

ANCDF DEACTIVATION FURNACE SYSTEM (DFS)

ANCDF DFS

ALARM AND INTERLOCK MATRIX

P&IDs: AN-1-D-501, -502, -531/1, -531/2, -533, AN-6-D-509, AN-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

ANCDF DFS

Left Column	Right Column
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SPARE
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM
	ALERT

ITM NUM	TAG NUMBER			DESCRIPTION	SET POINT	B8:010/ 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 / 7 6 5 4 3 2 1 0 7 6 5 4 3 2 1 0	B8:011/ 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 / 7 6 5 4 3 2 1 0 7 6 5 4 3 2 1 0	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
96	16	TSLL	197	AFTERBURNER CHAMBER RELIGHT	1400°F			Input to system purge bypass (see Appendix D for logic).	1020/12	NA
97	16	PAH	201	FURN-102 MAIN FUEL GAS	1.5 psig		X		2250/04	NA
98	16	PAL	201	FURN-102 MAIN FUEL GAS	1.0 psig		X		2250/02	NA
99	16	TAHH	202	MMS-CHUT-101	280°F	X			0453/02	80
100	16	TAHH	203	MMS-CHUT-102	280°F	X			0453/04	82
101	16	PSHH	204	KILN CHAMBER PRESSURE	-0.1 in wc	X		RCRA AWFCO DFS-05. 5 sec delay.	0420/10	176
102	16	XS	207	MMS-CHUT-101 ABOVE GATE-101	JAM	X		RCRA AWFCO DFS-24; 10 sec delay.	0221/14	84
103	16	XA	208	DFS-CHUT-101 BELOW GATE-101	JAM	X		10 sec delay.	0221/16	86
104	16	XS	209	MMS-CHUT-102 ABOVE GATE-102	JAM	X		RCRA AWFCO DFS-24; 10 sec delay.	0222/00	88
105	16	XA	210	DFS-CHUT-102 BELOW GATE-102	JAM	X		10 sec delay.	0222/02	90
106	16	PSL	214	DFS-LUBE OIL SYS.	15 psig	X X X		Swithover to backup pump after 10 sec delay. If alarm is active for 30 sec, stop feed and S/D kiln and lube oil system.	I:106/10 0222/04	92
107	16	PAH	218	FURN-101 MAIN FUEL GAS	2.0 psig		X		2050/04	NA
108	16	PAL	218	FURN-101 MAIN FUEL GAS	1.0 psig		X		2050/02	NA
109	16	PAH	229	FURN-102 PILOT FUEL GAS	1.99 psig		X		2250/06	NA
110	16	XA	263	DFS GEARBOX L.O.S.	TROUBLE			40 sec delay.	0222/06	NA
111	16	PAL	283	KILN COMB. AIR LOW PRESS.	9 in wc		X		2050/06	NA
112	16	PSLL	301	AFTERBURNER #1 COMB. AIR	5 in wc	X		3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/14	NA
113	16	PSLL	302	AFTERBURNER #2 COMB. AIR	5 in wc	X		3 sec delay. BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/04	NA
114	16	TISH	345	DFS GEARBOX LUBE OIL	180°F			Local alarm & input to 16-XA-263.	NA	NA
115	16	FSL	346	DFS GEARBOX LUBE OIL	0.75 gpm			Local alarm & input to 16-XA-263.	NA	NA
116	16	PSL	349	DFS GEARBOX LUBE OIL	3.0 psig			Local alarm & input to 16-XA-263.	NA	NA
117	16	LSL	350	DFS GEARBOX LUBE OIL	1.5 in	X		3 sec delay. Level above suction.	0222/10	178
118	16	SAHH	602	KILN SPEED	2.00 rpm	X		RCRA AWFCO DFS-20.	0250/10	260
119	16	SALL	602	KILN SPEED	0.33 rpm	X		RCRA AWFCO DFS-21.	0250/20	270
120	16	PDAH	801	TRUNNION FILTER DELTA PRESS.	35 psig			Local alarm & input to 16-XA-153.	NA	NA
121	16	PDAH	802	TRUNNION FILTER DELTA PRESS.	35 psig			Local alarm & input to 16-XA-153.	NA	NA
122	16	FAH	813	FURN-102 EXHAUST FLOW	1400 ft3/sec	X			1051/10	98

CH 3

CH 2

ANCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

ANCDF DFS   **ANCDF DFS**

P&IDs: AN-1-D-501, -502, -531/1, -531/2, -533, AN-6-D-509, AN-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

F-Column	P-Column
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SPARE
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM
	ALERT

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	B8:010/	B8:011/	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
123	16 KAL 813	FURN-102 EXHAUST RESIDENCE TIME	2.0 sec	X		SP per Jan 2001 AN DFS mtg.	1051/12	96
124	16 PDAH 813	AB CHAMBER EXHAUST DELTA P	**1.0 in wc**	X		RCRA AWFCO DFS-07. SP per Jan 2001 AN DFS mtg.	1052/06	190
125	16 XS 821	HDC LOWER GATE	JAM	X ... X X		RCRA AWFCO DFS-22. 10 sec delay.	0222/12	100
126	16 PSHH 832	FURN-101 PILOT F.G.	21 in wc	X		3 sec delay.	2020/14	NA
127	16 BSLL 844	KILN BURNER	LOCKOUT	X X X		NFPA.	2020/12	102
128	16 BSLL 850	AFTERBURNER #1	LOCKOUT	X X		NFPA.	2220/16	104
129	16 BSLL 850/1	AB1 & AB2 LOCKOUT	LOCKOUT	X X X X X X		NFPA.	2220/16 2420/16	22
130	16 BSLL 851	AFTERBURNER #2	LOCKOUT	X X		NFPA.	2420/06	106
131	16 PSHH 852	AFTERBURNER PILOT FUEL GAS	2.5 psig	X		3 sec delay.	2221/00	NA
132	16 XS 858	KILN BURNER MANAG. PANEL	E-STOP	X X X X		Local E-stop.	2020/16	108
133	16 XS 859	AFTBNR BURNER MANAG. PANEL	E-STOP	X X X X X		Local E-stop.	1021/10	110
134	20 PSLL 117	PLANT AIR NOT AVAILABLE (DICO)	SEE REMARKS	X		See site-specific compressed air system FAWB for setpoint.	**0005/01**	224
135	20 PSLL 730	INSTRUMENT AIR NOT AVAILABLE (DICO)	SEE REMARKS	X		See site-specific compressed air system FAWB for setpoint.	0205/14	228
136	71 XS 005	SHIFT SUPER CONSOLE	E-STOP	X X X X X X X **X**	X X X	Response per April 2001 code.	0220/02	20
137	71 XS 025	LEAD OPER. CONSOLE	E-STOP	X X X X X X X **X**	X X X	Response per April 2001 code.	0220/14	20
138	71 XS 045	FURN. OPER. #1 CONSOLE	E-STOP	X X X X X X X **X**	X X X	Response per April 2001 code.	0220/16	20
139	71 XS 065	FURN. OPER. #2 CONSOLE	E-STOP	X X X X X X X **X**	X X X	Response per April 2001 code.	0221/02	20
140	71 XS 085	DEMIL/FURN OPER CONSOLE	E-STOP	X X X X X X X **X**	X X X	Response per April 2001 code.	0221/04	20
141	71 XS 145	DEMIL/FURN OPER CONSOLE	E-STOP	X X X X X X X **X**	X X X	Response per April 2001 code.	0222/16	20
142	PREP CHANGE	WASTE BIN CHANGEOUT PREALARM	4 MIN	X			0223/04	NA
143	CHANGE BIN	ROCKETS IN BIN	>65			Start 6-min bin changeout timer.	0223/00	NA
144	NA	SURROGATE FEED RATE	257.1 lb/hr	X		RCRA AWFCO DFS-13. See NOTE 4.	TBD	TBD

NOTE 1: High order detonation closes the following isolation valves: 16-XV-054, -071, -097A, -171, -285, -286, -403, and 16-XY-003, -052, -053, -178, -179. Also DICO to ICS-CONR-105 to close 18-HDV-119, -219 (B4:67/00).

NOTE 2: The following alarms are shown on the referenced revisions of the P&IDs but are not included in the matrix because they will be deleted from the design based on the ANCDF Jan 2001 DFS review meeting:
    16-TALL-008, 16-SAL-015, and 16-SAL-602.

NOTE 3: At the Jan 2001 DFS review meeting, ANCDF stated that there will be no alarms for non-RCRA CEMS. See PAS/PFS FAWB (Programmatic Process FAWB Book 28) for ACAMS and RCRA CEMS alarms.

NOTE 4: Surrogate feed rate is listed for systemization. Agent/explosive/munition feed rate limits will be included in a future revision to this matrix.

PBCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

PBCDF DFS (left)   **PBCDF DFS** (right)

P&IDs: PB-1-D-501, -502, -532, -533, -537, PB-6-D-509, PB-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Left functions	Right functions
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SHUTDOWN EMPTY OUT PUMP
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM

ITM NUM	TAG NUMBER			DESCRIPTION	SET POINT	B8:010/	B8:011/	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
1	03	XA	131	MMS-GATE-103 MALFUNCTION	MALF	X X		See FAWB Note B-14.	0268/11	258
2	03	FAH	178	DFS GATES/CHUTES FLOW	3 gpm	X		Sum of water/decon flows to MMS-GATE-101/102 and MMS-CHUT-101/102 (see FAWB Note B-5). AN added 60 s delay.	TBD	TBD
3	03	XA	231	MMS-GATE-104 MALFUNCTION	MALF	X X		See FAWB Note B-14.	0269/11	94
4	16	XA	001	DFS-GATE-101 MALFUNCTION	MALF	X X			0260/11	24
5	16	XA	002	DFS-GATE-102 MALFUNCTION	MALF	X X			0261/11	26
6	16	TSH	004A-J	TRUNNION & THRUST BEARING	240°F		X	5 sec delay. Alarms on high temp for any of 16-TSH-004A thru -004J	0220/00	NA
7	16	PSH	007A	HIGH ORDER DETONATION	0.5 psig	X X X X	X X X X X		0220/04	28
8	16	PSH	007B	HIGH ORDER DETONATION	0.5 psig	X X X X	X X X X X		0220/06	28
9	16	TAH	008	KILN EXHAUST	TBD		X		1050/02	NA
10	16	TAHH	008	KILN EXHAUST	1600°F	X		RCRA AWFCO DFS-02. See NOTE 2.	1050/00	30
11	16	TAL	008	KILN EXHAUST	850°F		X		TBD	NA
12	16	TALL	008	KILN EXHAUST	750°F	X		RCRA AWFCO DFS-03. See NOTE 2. Alarm listed in permit as TAL-08.	1052/10	268
13	16	AAL	009	KILN EXHAUST O2	3% O2				1020/00	NA
14	16	AISH	011	FUEL GAS LEAKAGE TO ROOM	25% LEL	X		3 sec delay. See NOTE 3.	0220/10	214
15	16	SAL	015	KILN HOME POSITION SWITCH	TBD			Shown on PB-1-D-532.	TBD	NA
16	16	SS	015	KILN HOME POSITION SWITCH	NA			Feed requirement for rockets.	I:110/06	NA
17	16	PAH	018	KILN PRESSURE	-0.3 in wc		X	20 sec delay. Note: AN deleted time delay.	0450/02	230
18	16	PAL	018	KILN PRESSURE	-0.85 in wc		X	20 sec delay. Note: AN deleted time delay.	0450/00	NA
19	16	XS	019	KILN DISCHARGE CHUTE JAM	JAM	X X		10 sec delay.	0220/12	32
20	16	TAH	020	ROTARY KILN	1150°F		X		0450/06	NA
21	16	TAHH	020	ROTARY KILN	1300°F	X			0450/10	34
22	16	TAL	020	ROTARY KILN	1000°F		X		0450/04	NA
23	16	TALL	020	ROTARY KILN	950°F	X X			0453/06	164
24	16	FFAH	021	KILN BURNER AIR/FUEL	300%EX.AIR		X		2050/02	NA
25	16	FFAL	021	KILN BURNER AIR/FUEL	15%EX.AIR		X	40 sec delay.	2050/10	NA
26	16	PSLL	023	FUEL GAS SUPPLY TO KILN BURN	0.75 psig	X		3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/00	NA
27	16	PSHH	025	FUEL GAS SUPPLY TO KILN BURN	1.75 psig	X		3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/02	NA
28	16	PAH	026	KILN BURNER PILOT GAS	1.0 psig		X		2050/00	NA

PBCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

PBCDF DFS   **PBCDF DFS**

P&IDs: PB-1-D-501, -502, -532, -533, -537, PB-6-D-509, PB-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Interlock / Function list (B8:010/ — F-side):

Bit	Function
F00	SPARE
F01	CLOSE ISOLATION VALVES (SEE NOTE 1)
F02	SHUTDOWN KILN LUBE OIL
F03	SHUTDOWN HEATED DISCHARGE CONVEYOR
F04	SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
F05	SHUTDOWN KILN DRIVE
F06	OSCILLATE KILN DRIVE
F07	SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
F10	SHUTDOWN AFTERBURNER #2
F11	SHUTDOWN AFTERBURNER #1
F12	SHUTDOWN KILN COMBUSTION AIR BLOWER
F13	SHUTDOWN KILN BURNER
F14	CLOSE KILN SHROUD DAMPERS
F15	OPEN KILN SHROUD DAMPERS
F16	SPARE
F17	STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
	MALFUNCTION

Interlock / Function list (B8:011/ — P-side):

Bit	Function
P17	SPARE
P16	SPARE
P15	SPARE
P14	SPARE
P13	S/D DEMISTER WATER RETURN PUMP
P12	SWITCHOVER BRINE PUMP TO BACKUP
P11	SWITCHOVER CL LIQ PUMP TO BACKUP
P10	SHUTDOWN EMPTY OUT PUMP
P07	SHUTDOWN BRINE PUMP
P06	SHUTDOWN CLEAN LIQUOR PUMP
P05	SPARE
P04	SPARE
P03	SPARE
P02	SPARE
P01	SHUTDOWN ID FAN 1ST STAGE
P00	SHUTDOWN ID FAN 2ND STAGE
	PREALARM

MALFUNCTION / PREALARM data matrix

ITM NUM	(16) TAG NUMBER	DESCRIPTION	SET POINT	B8:010/ (F bits set)	B8:011/ (P bits set)	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
29	16 PSLL 029	KILN COMB. AIR	20 in wc	F13		3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/04	NA
30	16 XA 040	KILN DRIVE	MALF	F17, F16, F13			0266/11	36
31	16 TAH 042	DFS HEATED DISCHARGE CONV.	1200°F		PREALARM		0451/12	NA
32	16 TAHH 042	DFS HEATED DISCHARGE CONV.	1300°F	F17, F06, F05			0451/14	38
33	16 TAL 042	DFS HEATED DISCHARGE CONV.	1050°F		PREALARM		0451/10	NA
34	16 TALL 042	DFS HEATED DISCHARGE CONV.	1000°F	F17, F07		RCRA AWFCO DFS-08. See NOTE 2. If in AUTO, PLC logic will S/D HDC drive at 1000°F (decreasing temp).	0451/06	40
35	16 XA 045	DFS HEATED DISCHARGE CONV.	MALF	F17, F06, F05			0263/11	42
36	16 TAH 051A	KILN SKIN TEMP. #1	1450°F		PREALARM		0451/16	NA
37	16 TAHH 051A	KILN SKIN TEMP. #1	1600°F	F17		RCRA AWFCO DFS-06. TSCA. 60 sec delay (Note: AN deleted delay). See NOTE 2.	0452/00	44
38	16 TAH 051B	KILN SKIN TEMP. #2	1450°F		PREALARM		0452/02	NA
39	16 TAHH 051B	KILN SKIN TEMP. #2	1600°F	F17		RCRA AWFCO DFS-06. TSCA. 60 sec delay (Note: AN deleted delay). See NOTE 2.	0452/04	46
40	16 TAH 051C	KILN SKIN TEMP. #3	1450°F		PREALARM		0452/06	NA
41	16 TAHH 051C	KILN SKIN TEMP. #3	1600°F	F17		RCRA AWFCO DFS-06. TSCA. 60 sec delay (Note: AN deleted delay). See NOTE 2.	0452/10	48
42	16 TAH 051D	KILN SKIN TEMP. #4	1450°F		PREALARM		0452/12	NA
43	16 TAHH 051D	KILN SKIN TEMP. #4	1600°F	F17		RCRA AWFCO DFS-06. TSCA. 60 sec delay (Note: AN deleted delay). See NOTE 2.	0452/14	50
44	16 TAH 051E	KILN SKIN TEMP. #5	1450°F		PREALARM		0452/16	NA
45	16 TAHH 051E	KILN SKIN TEMP. #5	1600°F	F17		RCRA AWFCO DFS-06. TSCA. 60 sec delay (Note: AN deleted delay). See NOTE 2.	0453/00	52
46	16 SSL 057	HDC STOPPED	0 rpm	F17, F07		RCRA AWFCO DFS-10. 5 sec delay. See NOTE 2.	0223/12	272
47	16 XS 058	HDC UPPER GATE JAM SENSOR	JAM	F17, F07, F06		RCRA AWFCO DFS-09. 10 sec delay. See NOTE 2.	0221/00	54
48	16 TSHH 062	KILN ETL	1750°F	F14		BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	0420/00	NA
49	16 TSL 062	KILN 1400F RELIGHT	1400°F			Purge bypass not available	0421/04	NA
50	16 TSLL 062	KILN TEMPERATURE	900°F		PREALARM		0420/02	56
51	16 PAH 065	AB CHAMBER PRESSURE	-0.1 in wc		PREALARM	RCRA AWFCO DFS-31. 15 sec delay. See NOTE 2.	1050/16	TBD
52	16 PAL 065	AB CHAMBER PRESSURE	-5.0 in wc		P00	15 sec delay.	1050/14	NA

PBCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

PBCDF DFS   **PBCDF DFS**

P&IDs: PB-1-D-501, -502, -532, -533, -537, PB-6-D-509, PB-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Left functions (F):
- F00-SPARE
- F01-CLOSE ISOLATION VALVES (SEE NOTE 1)
- F02-SHUTDOWN KILN LUBE OIL
- F03-SHUTDOWN HEATED DISCHARGE CONVEYOR
- F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
- F05-SHUTDOWN KILN DRIVE
- F06-OSCILLATE KILN DRIVE
- F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
- F10-SHUTDOWN AFTERBURNER #2
- F11-SHUTDOWN AFTERBURNER #1
- F12-SHUTDOWN KILN COMBUSTION AIR BLOWER
- F13-SHUTDOWN KILN BURNER
- F14-CLOSE KILN SHROUD DAMPERS
- F15-OPEN KILN SHROUD DAMPERS
- F16-SPARE
- F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
- MALFUNCTION

Right functions (P):
- P17-SPARE
- P16-SPARE
- P15-SPARE
- P14-SPARE
- P13-S/D DEMISTER WATER RETURN PUMP
- P12-SWITCHOVER BRINE PUMP TO BACKUP
- P11-SWITCHOVER CL LIQ PUMP TO BACKUP
- P10-SHUTDOWN EMPTY OUT PUMP
- P07-SHUTDOWN BRINE PUMP
- P06-SHUTDOWN CLEAN LIQUOR PUMP
- P05-SPARE
- P04-SPARE
- P03-SPARE
- P02-SPARE
- P01-SHUTDOWN ID FAN 1ST STAGE
- P00-SHUTDOWN ID FAN 2ND STAGE
- PREALARM

ITM NUM	UNIT	TAG NUMBER	DESCRIPTION	SET POINT	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
53	16	PSLL 068	FUEL GAS TO AB2	0.75 psig	BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/00	NA
54	16	PSHH 069	FUEL GAS TO AB2	2.5 psig	BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/02	NA
55	16	FSL 076	FEED CHUTE QUENCH FLOW	0.6 gpm	5 sec delay.	0420/12	NA
56	16	FFAH 078	AB#1 FUEL GAS TO CMB AIR RATIO	300%EX.AIR		2250/12	NA
57	16	FFAL 078	AB#1 FUEL GAS TO CMB AIR RATIO	15% EX.AIR	10 sec delay.	2250/10	NA
58	16	FFAH 079	AB#2 FUEL GAS TO CMB AIR RATIO	300%EX.AIR		2450/02	NA
59	16	FFAL 079	AB#2 FUEL GAS TO CMB AIR RATIO	15% EX.AIR	10 sec delay.	2450/00	NA
60	16	TAH 092	AFTERBURNER CHAMBER	2300°F		1050/12	NA
61	16	TAHH 092	AFTERBURNER CHAMBER	2350°F	RCRA AWFCO DFS-14. SPs: 2350°F (rockets), 2150°F (other munitions). See NOTE 2.	1051/14	168
62	16	TAL 092	AFTERBURNER CHAMBER	2100°F		1050/10	234
63	16	TALL 092	AFTERBURNER CHAMBER	SEE REMARKS	RCRA AWFCO DFS-13. SPs: 2050°F (rockets), 1850°F (other munitions). See NOTE 2.	1050/06	58
64	16	PSL 096	QUENCH WATER TO KILN EXHAUST	40 psig	5 sec delay.	1020/06	60
65	16	SALL 098	KILN SPEED	0.33 rpm	Alarm is not shown on PB-1-D-532 but is in baseline code.	250/06	270
66	16	IAH 099	HDC DRIVE MOTOR CURRENT	1.8 amp		0250/00	170
67	16	IAH 100	KILN DRIVE MOTOR CURRENT	6.5 amp		0250/02	172
68	16	PAL 106	AFTERBURNER COMBUSTION AIR	9 in wc		2250/00	
69	16	XA 109	KILN COMBUSTION AIR BLOWER	MALF	BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2060/11	NA
70	16	XA 113	AB COMBUSTION AIR BLOWER	MALF	BMS 3-P running interlock for AB #1 & AB #2. See 16-BSLL-850/851 for LOCKOUT interlocks.	2260/11	NA
71	16	PDISH 148	CYCLONE DELTA PRESS	2 in wc	5 sec delay.	1020/10	232
72	16	TAH 150	FEED CHUTE 101	260°F		0450/12	NA
73	16	FSL 151A-J	TRUNNION/THRUST LUBE OIL	400 cu in/min	Local alarm & input to 16-XA-153.	NA	NA
74	16	LSL 151	TRUN./THRUST LUBE OIL RESER.	8 in	3 sec delay.	0221/10	NA
75	16	LSLL 151	TRUN./THRUST LUBE OIL RESER.	4 in	3 sec delay.	0221/06	62
76	16	TSH 151	TRUN./THRUST LUBE OIL	150°F	Local alarm & input to 16-XA-153.	NA	NA
77	16	XA 153	TRUNNION L.O.S.	TROUBLE	Common trouble alarm.	0221/12	NA
78	16	TAH 154	FEED CHUTE 102	260°F		0450/14	NA
79	16	ZS 155	BLAST DOOR 101 NOT CLOSED	N/A		I:115/06	64
80	16	ZS 156A/C	BLAST DOOR 101 NOT LATCHED	N/A	Stop feed for either 16-ZS-156A or -156C not latched.	0273/13	64
81	16	ZS 159	BLAST DOOR 102 NOT CLOSED	N/A		I:115/13	66

PBCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

PBCDF DFS   P&IDs: PB-1-D-501, -502, -532, -533, -537, PB-6-D-509, PB-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10   **PBCDF DFS**

Interlock functions — B8:010 (left column):

- F00-SPARE
- F01-CLOSE ISOLATION VALVES (SEE NOTE 1)
- F02-SHUTDOWN KILN LUBE OIL
- F03-SHUTDOWN HEATED DISCHARGE CONVEYOR
- F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
- F05-SHUTDOWN KILN DRIVE
- F06-OSCILLATE KILN DRIVE
- F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
- F10-SHUTDOWN AFTERBURNER #2
- F11-SHUTDOWN AFTERBURNER #1
- F12-SHUTDOWN KILN COMBUSTION AIR BLOWER
- F13-SHUTDOWN KILN BURNER
- F14-CLOSE KILN SHROUD DAMPERS
- F15-OPEN KILN SHROUD DAMPERS
- F16-SPARE
- F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
- MALFUNCTION

Interlock functions — B8:011 (right column):

- P17-SPARE
- P16-SPARE
- P15-SPARE
- P14-SPARE
- P13-S/D DEMISTER WATER RETURN PUMP
- P12-SWITCHOVER BRINE PUMP TO BACKUP
- P11-SWITCHOVER CL LIQ PUMP TO BACKUP
- P10-SHUTDOWN EMPTY OUT PUMP
- P07-SHUTDOWN BRINE PUMP
- P06-SHUTDOWN CLEAN LIQUOR PUMP
- P05-SPARE
- P04-SPARE
- P03-SPARE
- P02-SPARE
- P01-SHUTDOWN ID FAN 1ST STAGE
- P00-SHUTDOWN ID FAN 2ND STAGE
- PREALARM

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	B8:010 / B8:011 interlock bits marked (X)	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
82	16 ZS 160A/C/E	BLAST DOOR 102 NOT LATCHED	N/A	B8:010 bit17 (F17) X	Stop feed for any of 16-ZS-160A, -160C, or -160E not latched.	0274/13	66
83	16 PDAH 172	DECON/WATER FILTER (CHUTE 101)	10.0 in wc	B8:011 X		0453/10	NA
84	16 PDAH 173	DECON/WATER FILTER (CHUTE 102)	10.0 in wc	B8:011 X		0453/12	NA
85	16 PDAH 174	DECON/WATER FILTER (EXH DUCT)	10.0 in wc	B8:011 X		0453/14	NA
86	16 PSL 180	PRW TO MMS-CHUT-101	30 psig	B8:011 X	3 sec delay.	0420/04	NA
87	16 PSL 181	PRW TO MMS-CHUT-102	30 psig	B8:011 X	3 sec delay.	0420/06	NA
88	16 TAH 182	KILN EXHAUST GAS (PRE-QUENCH)	1525°F	B8:011 X	SP based on Jan 2001 AN DFS mtg.	1051/04	NA
89	16 TAHH 182	KILN EXHAUST GAS (PRE-QUENCH)	1900°F	B8:010 bit17 (F17) X, plus X, X	RCRA AWFCO DFS-01. 30 sec delay. See NOTE 2.	1051/06	70
90	16 TALL 182	KILN EXHAUST GAS (PRE-QUENCH)	SEE REMARKS	B8:010 bit17 (F17) X	RCRA AWFCO DFS-12. 3 sec delay. Permit SP is "1050°F except during start-up feed is allowed at 910°F up to 12 min to achieve 1000°F."	1051/00	68
91	16 ZS 183	WASTE BIN OUT OF POSITION	N/A	B8:010 bit17 (F17) X, plus X, X	6-min delay timer.	0222/14	72
92	16 TAH 184	HEATED DISCHARGE CONV.	1200°F	B8:011 X		0451/02	NA
93	16 TAHH 184	HEATED DISCHARGE CONV.	1300°F	B8:010 bit17 (F17) X, plus X X		0451/04	76
94	16 TAL 184	HEATED DISCHARGE CONV.	1050°F	B8:011 X		0451/00	NA
95	16 TALL 184	HEATED DISCHARGE CONV.	1000°F	B8:010 bit17 (F17) X, plus X	Note: RCRA at AN and TE. If in AUTO, PLC logic will S/D HDC drive at 1000°F (decreasing temp).	0450/16	74
96	16 PSLL 194	AB#1 FUEL GAS	0.75 psig	B8:010 X	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/10	NA
97	16 PSHH 195	AB#1 FUEL GAS	2.5 psig	B8:010 X	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/12	NA
98	16 TSH 197	FURN-102 KILN LIGHT PERM.	1500°F	B8:010 X	Kiln burner light permissive.	1020/16	78
99	16 TSHH 197	AFTERBURNER CHAMBER (ETL)	2400°F	B8:010 X X	BMS 3-P running interlock for AB #1 & AB #2. See 16-BSLL-850/851 for LOCKOUT interlocks.	1020/14	NA
100	16 TSL 197	AFTRBRNR CHAMBER RELIGHT	1400°F		Input to system purge bypass (see Appendix D for logic).	1020/12	NA
101	16 PAH 201	FURN-102 MAIN FUEL GAS	1.5 psig	B8:011 X		2250/04	NA
102	16 PAL 201	FURN-102 MAIN FUEL GAS	1.0 psig	B8:011 X		2250/02	NA
103	16 TAHH 202	MMS-CHUT-101	280°F	B8:010 bit17 (F17) X		0453/02	80
104	16 TAHH 203	MMS-CHUT-102	280°F	B8:010 bit17 (F17) X		0453/04	82
105	16 PSHH 204	KILN CHAMBER PRESSURE	-0.1 in wc	B8:010 bit17 (F17) X	RCRA AWFCO DFS-05. See NOTE 2. Note: ANCDF added 5 sec time delay.	0420/10	176
106	16 XS 207	MMS-CHUT-101 ABOVE GATE-101	JAM	B8:010 bit17 (F17) X	RCRA AWFCO DFS-04. See NOTE 2. 10 sec delay.	0221/14	84

PBCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

PBCDF DFS | | **PBCDF DFS**

P&IDs: PB-1-D-501, -502, -532, -533, -537, PB-6-D-509, PB-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Left functions (B8:010):
- F00-SPARE
- F01-CLOSE ISOLATION VALVES (SEE NOTE 1)
- F02-SHUTDOWN KILN LUBE OIL
- F03-SHUTDOWN HEATED DISCHARGE CONVEYOR
- F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
- F05-SHUTDOWN KILN DRIVE
- F06-OSCILLATE KILN DRIVE
- F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
- F10-SHUTDOWN AFTERBURNER #2
- F11-SHUTDOWN AFTERBURNER #1
- F12-SHUTDOWN KILN COMBUSTION AIR BLOWER
- F13-SHUTDOWN KILN BURNER
- F14-CLOSE KILN SHROUD DAMPERS
- F15-OPEN KILN SHROUD DAMPERS
- F16-SPARE
- F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
- MALFUNCTION

Right functions (B8:011):
- P17-SPARE
- P16-SPARE
- P15-SPARE
- P14-SPARE
- P13-S/D DEMISTER WATER RETURN PUMP
- P12-SWITCHOVER BRINE PUMP TO BACKUP
- P11-SWITCHOVER CL LIQ PUMP TO BACKUP
- P10-SHUTDOWN EMPTY OUT PUMP
- P07-SHUTDOWN BRINE PUMP
- P06-SHUTDOWN CLEAN LIQUOR PUMP
- P05-SPARE
- P04-SPARE
- P03-SPARE
- P02-SPARE
- P01-SHUTDOWN ID FAN 1ST STAGE
- P00-SHUTDOWN ID FAN 2ND STAGE
- PREALARM

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	Interlock functions (X marks)	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
107	16 XA 208	DFS-CHUT-101 BELOW GATE-101	JAM	F17	10 sec delay.	0221/16	86
108	16 XS 209	MMS-CHUT-102 ABOVE GATE-102	JAM	F17	RCRA AWFCO DFS-04. See NOTE 2. 10 sec delay.	0222/00	88
109	16 XA 210	DFS-CHUT-102 BELOW GATE-102	JAM	F17	10 sec delay.	0222/02	90
110	16 PSL 214	DFS-LUBE OIL SYS.	30 psig	F17, F13, F11	Swithover to backup pump after 10 sec delay. If alarm is active for 30 sec, stop feed and S/D kiln and lube oil system.	I:106/10 0222/04	92
111	16 PAH 218	FURN-101 MAIN FUEL GAS	2.0 psig	PREALARM		2050/04	NA
112	16 PAL 218	FURN-101 MAIN FUEL GAS	1.0 psig	PREALARM		2050/02	NA
113	16 PAH 229	FURN-102 PILOT FUEL GAS	1.99 psig	PREALARM		2250/06	NA
114	16 XA 263	DFS GEARBOX L.O.S.	TROUBLE		40 sec delay.	0222/06	NA
115	16 PAL 283	KILN COMB. AIR LOW PRESS.	9 in wc	PREALARM		2050/06	NA
116	16 PSLL 301	AFTERBURNER #1 COMB. AIR	5 in wc	F11	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/14	NA
117	16 PSLL 302	AFTERBURNER #2 COMB. AIR	5 in wc	F10	3 sec delay. BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/04	NA
118	16 TISH 345	DFS GEARBOX LUBE OIL	180°F		Local alarm & input to 16-XA-263.	NA	NA
119	16 FSL 346	DFS GEARBOX LUBE OIL	0.75 gpm		Local alarm & input to 16-XA-263.	NA	NA
120	16 PSL 349	DFS GEARBOX LUBE OIL	3.0 psig		Local alarm & input to 16-XA-263.	NA	NA
121	16 LSL 350	DFS GEARBOX LUBE OIL	1.5 in	F17	3 sec delay. Level above suction.	0222/10	178
122	16 SAHH 602	KILN SPEED	2.00 rpm	F17	RCRA AWFCO DFS-28. See NOTE 2. Alarm not shown on PB-1-D-532.	0250/10	260
123	16 SAL 602	KILN SPEED	TBD	PREALARM	Shown on UM-1-D-531	TBD	NA
124	16 SALL 602	KILN SPEED	0.33 rpm	F17	Alarm is not shown on PB-1-D-532 but is in baseline code. RCRA at AN and TE.	0250/04	270
125	16 PDAH 801	TRUNNION FILTER DELTA PRESS.	35 psig		Local alarm & input to 16-XA-153.	NA	NA
126	16 PDAH 802	TRUNNION FILTER DELTA PRESS.	35 psig		Local alarm & input to 16-XA-153.	NA	NA
127	16 FAH 813	FURN-102 EXHAUST FLOW	1400 ft3/sec	F17		1051/10	98
128	16 KAL 813	FURN-102 EXHAUST RESIDE TIME	2.0 sec	F17	SP based on Jan 2001 AN DFS mtg.	1051/12	96
129	16 PDAH 813	AB CHAMBER EXHAUST DELTA P	0.9 in wc	F17	RCRA AWFCO DFS-11. See NOTE 2.	1052/06	190
130	16 XS 821	HDC LOWER GATE	JAM	F17, F13, F11	RCRA AWFCO DFS-09. 10 sec delay. See NOTE 2.	0222/12	100
131	16 PSHH 832	FURN-101 PILOT F.G.	21 in wc	F17	3 sec delay.	2020/14	NA
132	16 BSLL 844	KILN BURNER	LOCKOUT	F17, F13, F11	RCRA AWFCO DFS-34. See NOTE 2.	2020/12	102
133	16 BSLL 850	AFTERBURNER #1	LOCKOUT	F17, F11	NFPA.	2220/16	104
134	16 BSLL 850/1	AB1 & AB2 LOCKOUT	LOCKOUT	F17, F13, F11, F10, F07	RCRA AWFCO DFS-07. See NOTE 2.	2220/16 2420/16	22
135	16 BSLL 851	AFTERBURNER #2	LOCKOUT	F17, F10	NFPA.	2420/06	106

PBCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

PBCDF DFS   **PBCDF DFS**

P&IDs: PB-1-D-501, -502, -532, -533, -537, PB-6-D-509, PB-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Left Functions	Right Functions
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SHUTDOWN EMPTY OUT PUMP
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM

ITM NUM	TAG NUMBER			DESCRIPTION	SET POINT	B8:010/	B8:011/	PREALARM	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
136	16	PSHH	852	AFTERBURNER PILOT FUEL GAS	2.5 psig	X			3 sec delay.	2221/00	NA
137	16	XS	858	KILN BURNER MANAG. PANEL	E-STOP	X X X X			Local E-stop.	2020/16	108
138	16	XS	859	AFTBNR BURNER MANAG. PANEL	E-STOP	X X X X X			Local E-stop.	1021/10	110
139	20	PSLL	117	PLANT AIR NOT AVAILABLE (DICO)	SEE REMARKS	X			See site-specific compressed air system FAWB for setpoint.	B4:17/01	224
140	20	PSLL	730	INSTRUMENT AIR NOT AVAILABLE (DICO)	SEE REMARKS	X			See site-specific compressed air system FAWB for setpoint.	0205/14	228
141	71	XS	005	SHIFT SUPER CONSOLE	E-STOP	X X X X X X X X X X X	X X X X X X X X		Response per April 2001 AN code.	0220/02	20
142	71	XS	025	LEAD OPER. CONSOLE	E-STOP	X X X X X X X X X X X	X X X X X X X X		Response per April 2001 AN code.	0220/14	20
143	71	XS	045	FURN. OPER. #1 CONSOLE	E-STOP	X X X X X X X X X X X	X X X X X X X X		Response per April 2001 AN code.	0220/16	20
144	71	XS	065	FURN. OPER. #2 CONSOLE	E-STOP	X X X X X X X X X X X	X X X X X X X X		Response per April 2001 AN code.	0221/02	20
145	71	XS	085	DEMIL/FURN OPER CONSOLE	E-STOP	X X X X X X X X X X X	X X X X X X X X		Response per April 2001 AN code.	0221/04	20
146	71	XS	145	DEMIL/FURN OPER CONSOLE	E-STOP	X X X X X X X X X X X	X X X X X X X X		Response per April 2001 AN code. E-stop to be added to PB-1-D-533 by PBAC1014ICS.	0222/16	20
147	PREP CHANGE			WASTE BIN CHANGEOURT PREALARM	4 MIN			X		0223/04	NA
148	CHANGE BIN			ROCKETS IN BIN	>65				Start 6-min bin changeout timer.	0223/00	NA
149	16 / 16 / 16	ZQI / ZQI / ZI	128 / 228 / 106	MUNITIONS PER HOUR	SEE REMARKS	X			RCRA AWFCO DFS-17. SPs: 70 mun/hr for mines, 40 mun/hr for rockets. See NOTE 2.	TBD	TBD

NOTE 1: High order detonation closes the following isolation valves: 16-XV-054, -071, -097A, -171, -285, -286, -403, and 16-XY-003, -052, -053, -178, -179. Also DICO to ICS-CONR-105 to close 18-HDV-119, -219 (B4:67/00).

NOTE 2: RCRA AWFCO setpoints from 1-15-99 PBCDF RCRA permit Table VII-15 - Deactivation Furnace System Waste-Feed Cutoff Parameters. Some setpoints may be modified based on trial burn results.

NOTE 3: The CEMS alarm in the A&I matrix reflects the alarms in approved RFI S-ALL-249, which documents the operation, alarm, interlock requirements, and setpoints for the CEMS non-agent monitors. The EIC is using this RFI as a basis for the PBCDF PLC software code. Parsons will be preparing ECPs to implement this RFI into the PBCDF design. CEMS alarms associated with monitors downstream of the DFS afterburner are included in the PAS/PFS FAWB, Book 28. ACAMS alarms are also in the PAS/PFS FAWB.

TOCDF
ALARM AND INTERLOCK MATRIX (NOTES 1,2)
SYSTEM: DEACTIVATION FURNACE SYSTEM (DFS)

PLC: ICS-CONR-112
INTERLOCK: I-10
P&IDs: TE-1-D-501,-502,-531/1,-531/2,-533, TE-6-D-509

Column key:
1. STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
2. OPEN KILN SHROUD AIR DAMPERS
3. CLOSE KILN SHROUD AIR DAMPERS
4. SHUTDOWN KILN BURNER
5. SHUTDOWN KILN COMBUSTION AIR BLOWER / CLOSE COMB. AIR DAMPER
6. SHUTDOWN AFTERBURNER #1
7. SHUTDOWN AFTERBURNER #2
8. SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
9. SHUTDOWN ID FAN / OPEN ID FAN DAMPER
10. SHUTDOWN ID FAN LUBE OIL SYSTEM
11. OSCILLATE ROTARY KILN
12. SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
13. SHUTDOWN KILN DRIVE
14. SHUTDOWN KILN LUBE OIL SYSTEM
15. SHUTDOWN HEATED DISCHARGE CONVEYOR DRIVE
16. SHUTDOWN WATER RETURN PUMP
17. SHUTDOWN BRINE PUMPS
18. SHUTDOWN CLEAN LIQUOR PUMP
19. KILN BURNER LOCKOUT
20. AFTERBURNER #1 LOCKOUT
21. AFTERBURNER #2 LOCKOUT
22. PREALARM
23. ALARM

ITM	TAG NUMBER	DESCRIPTION	SETPOINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	REMARKS	ALARM BIT B001:XX/XX
1	03-XA-131	MMS GATE 103	MALF	X																						X	See FAWB Note B-14	0268/11
2	03-XA-231	MMS GATE 104	MALF	X																						X	See FAWB Note B-14	0269/11
3	16-XA-001	DFS GATE 101	MALF	X																						X	Remove feed DICO to 101 A/C,B	0260/11
4	16-XA-002	DFS GATE 102	MALF	X																						X	Remove feed DICO to 104 A,B	0261/11
5	16-TSH-004A-J	TRUNNION & THRUST BEARING TEMP	240°F																						X		5 sec delay. Alarm on high temp for any of 16-TSH-004A thru J	0220/00
6	16-PSH-007A	HIGH ORDER DETONATION	0.5 psig	X			X	X	X					X	X	X	X									X	Close isolation valves (see NOTE 3)	0220/04
7	16-PSH-007B	HIGH ORDER DETONATION	0.5 psig	X			X	X	X					X	X	X	X									X	Close isolation valves (see NOTE 3)	0220/04
8	16-TAH-008	KILN EXHAUST TEMP (QUENCHED)	1625°F																						X			1050/02
9	16-TAHH-008	KILN EXHAUST TEMP (QUENCHED)	1650°F	X																						X	RCRA AWFCO	1050/04
10	16-TALL-008	KILN EXHAUST TEMP (QUENCHED)	850°F	X								X														X	RCRA AWFCO	1022/16
11	16-AAL-009	KILN EXHAUST O2	12% O2																						X		3 sec delay.	1020/00
12	16-AISH-011	FUEL GAS LEAKAGE TO ROOM	25% LEL	X																						X		0220/10
13	16-ZS-015	KILN HOME POSITION SWITCH	N/A																								Feed requirement for line B (rocket feed)	I:110/06
14	16-PAH-018	KILN PRESSURE	-0.3 in wc																						X		20 sec delay	0450/02
15	16-PAL-018	KILN PRESSURE	-0.8 in wc																						X		20 sec delay	0450/00
16	16-PAL-018A	KILN PRESSURE (WIDE RANGE)	-8.0 in wc																						X		At same SP as alarm, if 16-PIC-018 is in MANUAL, PLC drives ID fan damper to 26% CV and venturi to 66% CV. After 5 sec., venturi controller controls in AUTO to 30 in wc. Alarm requires CON reset (see FAWB Note B-19).	0421/06
17	16-PALL-018A	KILN PRESSURE (WIDE RANGE)	-10.0 in wc									X														X	Alarm requires CON reset. At same SP as alarm, PLC shutdowns both stages of ID fan if both afterburner burners are not released to AUTO by the BMS (see FAWB Note B-19).	0421/10
18	16-XS-019	KILN DISCH. CHUTE JAM	JAM	X								X														X	10 sec delay	0220/12
19	16-TAH-020	ROTARY KILN TEMP	1250°F																						X			0450/06
20	16-TAHH-020	ROTARY KILN TEMP	1350°F	X																						X	Ref: TEMP-2679-DFS	0450/10
21	16-TAL-020	ROTARY KILN TEMP	1000°F																						X			0450/04
22	16-TALL-020	ROTARY KILN TEMP	950°F	X								X														X	Feed permissive temperature	0453/06
23	16-FFAH-021	KILN BURNER COMB. AIR	300% XS AIR																							X		2050/12
24	16-FFAL-021	KILN BURNER COMB. AIR	15% XS AIR																							X	40 sec delay.	2050/10
25	16-PSLL-023	KILN BURNER FUEL	6.0 osig																			X				X	3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/00
26	16-PSHH-025	KILN BURNER FUEL	1.75 psig																			X				X	3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/02
27	16-PAH-026	KILN BURNER PILOT F.G.	1.0 psig																						X			2050/00
28	16-PSLL-029	KILN COMB. AIR	20 in wc																			X				X	3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks. Enabled 5 sec after CAB start.	2020/04
29	16-XA-040	KILN DRIVE MALF.	MALF	X		X																				X		0266/11
30	16-TAH-042	HDC LOWER HEATERS	1200°F																						X			0451/12

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TOCDF
ALARM AND INTERLOCK MATRIX (NOTES 1,2)
SYSTEM: DEACTIVATION FURNACE SYSTEM (DFS)

PLC:  ICS-CONR-112
INTERLOCK: I-10
P&IDs: TE-1-D-501,-502,-531/1,-531/2,-533, TE-6-D-509
```

Column legend (1–23):

1 STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
2 OPEN KILN SHROUD AIR DAMPERS
3 CLOSE KILN SHROUD AIR DAMPERS
4 SHUTDOWN KILN BURNER
5 SHUTDOWN KILN COMBUSTION AIR BLOWER / CLOSE COMB. AIR DAMPER
6 SHUTDOWN AFTERBURNER #1
7 SHUTDOWN AFTERBURNER #2
8 SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
9 SHUTDOWN ID FAN / OPEN ID FAN DAMPER
10 SHUTDOWN ID FAN LUBE OIL SYSTEM
11 OSCILLATE ROTARY KILN
12 SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
13 SHUTDOWN KILN DRIVE
14 SHUTDOWN KILN LUBE OIL SYSTEM
15 SHUTDOWN HEATED DISCHARGE CONVEYOR DRIVE
16 SHUTDOWN WATER RETURN PUMP
17 SHUTDOWN BRINE PUMPS
18 SHUTDOWN CLEAN LIQUOR PUMP
19 KILN BURNER LOCKOUT
20 AFTERBURNER #1 LOCKOUT
21 AFTERBURNER #2 LOCKOUT
22 PREALARM
23 ALARM

ITM	TAG NUMBER	DESCRIPTION	SETPOINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	REMARKS	ALARM BIT B001:XX/XX
31	16-TAHH-042	HDC LOWER HEATERS	1300°F	X										X	X											X		0451/14
32	16-TAL-042	HDC LOWER HEATERS	1050°F																						X			0451/10
33	16-TALL-042	HDC LOWER HEATERS	1000°F	X										X		X										X	RCRA AWFCO. Alarm shuts down HDC drive if in MANUAL. If in AUTO, code control logic will S/D HDC drive at 1000°F (decreasing temp).	0451/06
34	16-XA-045	DFS HEATED DISCH. CONV. MALF.	MALF	X										X		X										X		0263/11
35	16-TAH-051A	KILN SKIN TEMP.	1450°F																						X			0451/16
36	16-TAHH-051A	KILN SKIN TEMP.	1500°F	X																						X	60 sec delay. TSCA	0452/00
37	16-TAH-051B	KILN SKIN TEMP.	1450°F																						X			0452/02
38	16-TAHH-051B	KILN SKIN TEMP.	1500°F	X																						X	60 sec delay. TSCA	0452/04
39	16-TAH-051C	KILN SKIN TEMP.	1450°F																						X			0452/06
40	16-TAHH-051C	KILN SKIN TEMP.	1500°F	X																						X	60 sec delay. TSCA	0452/10
41	16-TAH-051D	KILN SKIN TEMP.	1450°F																						X			0452/12
42	16-TAHH-051D	KILN SKIN TEMP.	1500°F	X																						X	60 sec delay. TSCA	0452/14
43	16-TAH-051E	KILN SKIN TEMP.	1450°F																						X			0452/16
44	16-TAHH-051E	KILN SKIN TEMP.	1500°F	X																						X	60 sec delay. TSCA	0453/00
45	16-SSLL-057	HDC STOPPED	0 rpm	X										X												X	RCRA AWFCO. 5 sec delay.	0223/12
46	16-XS-58	HDC TIP GATE JAM	JAM	X										X		X										X	RCRA AWFCO. 10 sec delay.	0221/00
47	16-TSHH-062	KILN EXTREME TEMP LIMIT	1750°F																			X				X	BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	0420/00
48	16-TSL-062	KILN PURGE BYPASS	1400°F																								Input to kiln purge bypass (see Appendix D for logic). CON alarm deleted by TEMP-2610-DFS.	0421/04
49	16-PAH-065	AB CHAMBER PRESS HI	-1.0 in wc																							X	15 sec delay.	1050/16
50	16-PAL-065	AB CHAMBER PRESS LOW	-5.0 in wc																							X	15 sec delay.	1050/14
51	16-PSLL-068	AB #2 FUEL GAS PRESS LOW-LOW	6.0 osig																					X		X	3 sec delay. BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/00
52	16-PSHH-069	AB #2 FUEL GAS PRESS HI-HI	2.5 psig																					X		X	3 sec delay. BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/02
53	16-FSL-076	FEED CHUTE QUENCH FLOW LOW	0.6 gpm																							X	5 sec delay. Alarm enabled when XV-236/235 is opened and TIC-150/154 CV > 0.	0420/12
54	16-FFAH-078	AB #1 COMB. AIR FLOW HIGH	300% XS AIR																							X		2250/12
55	16-FFAL-078	AB #1 COMB. AIR FLOW LOW	-50% XS AIR																							X	10 sec delay	2250/10
56	16-FFAH-079	AB #2 COMB. AIR FLOW HIGH	300% XS AIR																							X		2450/02
57	16-FFAL-079	AB #2 COMB. AIR FLOW LOW	-50% XS AIR																							X	10 sec delay	2450/00
58	16-TAH-092	AFTERBURNER CHAMBER	2300°F																						X			1050/12
59	16-TAHH-092	AFTERBURNER CHAMBER	2350°F	X																						X	RCRA AWFCO.	1051/14
60	16-TAL-092	AFTERBURNER CHAMBER	2100°F	X																						X		1050/10
61	16-TALL-092	AFTERBURNER CHAMBER	2050°F	X																						X	RCRA AWFCO.	1050/06

TOCDF
ALARM AND INTERLOCK MATRIX (NOTES 1,2)
SYSTEM: DEACTIVATION FURNACE SYSTEM (DFS)

PLC: ICS-CONR-112
INTERLOCK: I-10
P&IDs: TE-1-D-501,-502,-531/1,-531/2,-533, TE-6-D-509

Column (interlock action) legend:

1. STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
2. OPEN KILN SHROUD AIR DAMPERS
3. CLOSE KILN SHROUD AIR DAMPERS
4. SHUTDOWN KILN BURNER
5. SHUTDOWN KILN COMBUSTION AIR BLOWER / CLOSE COMB. AIR DAMPER
6. SHUTDOWN AFTERBURNER #1
7. SHUTDOWN AFTERBURNER #2
8. SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
9. SHUTDOWN ID FAN / OPEN ID FAN DAMPER
10. SHUTDOWN ID FAN LUBE OIL SYSTEM
11. OSCILLATE ROTARY KILN
12. SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
13. SHUTDOWN KILN DRIVE
14. SHUTDOWN KILN LUBE OIL SYSTEM
15. SHUTDOWN HEATED DISCHARGE CONVEYOR DRIVE
16. SHUTDOWN WATER RETURN PUMP
17. SHUTDOWN BRINE PUMPS
18. SHUTDOWN CLEAN LIQUOR PUMP
19. KILN BURNER LOCKOUT
20. AFTERBURNER #1 LOCKOUT
21. AFTERBURNER #2 LOCKOUT
22. PREALARM
23. ALARM

ITM	TAG NUMBER	DESCRIPTION	SETPOINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	REMARKS	ALARM BIT B001:XX/XX
62	16-PSL-096	QUENCH WATER TO KILN EXHAUST	40 psig																							X	5 sec delay.	1020/06
63	16-SALL-098	KILN SPEED	0.33 rpm	X																						X		0223/02
64	16-IAH-099	HDC DRIVE MOTOR CURRENT	1.8 amp	X										X				X								X		0250/00
65	16-IAH-100	KILN DRIVE MOTOR CURRENT	6.5 amp	X												X										X		0250/02
66	16-PAL-106	AFTERBURNER COMB. AIR	9.0 in wc																				X			X		2250/00
67	16-XA-109	KILN COMB. AIR BLOWER MALF.	MALF				X															X				X	BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2060/11
68	16-XA-113	AB COMB. AIR BLOWER MALF.	MALF						X														X	X		X	BMS 3-P running interlock for AB #1 & AB #2. See 16-BSLL-850/851 for LOCKOUT interlocks.	2260/11
69	16-PDISH-148	CYCLONE DELTA PRESS.	2 in wc	X																						X	5 sec delay.	1020/10
70	16-TAH-150	FEED CHUTE 101	260°F																						X			0450/12
71	16-FSL-151A-J	TRUNNION & THRUST BEARING LUBE OIL	400 in3/min																								Local alarm & input to common trouble alarm 16-XA-153	NA
72	16-LSL-151	TRUN. & THRUST LUBE OIL RESER.	8 in																						X		3 sec delay.	0221/10
73	16-LSLL-151	TRUN. & THRUST LUBE OIL RESER.	4 in	X																						X	3 sec delay.	0221/06
74	16-TSH-151	TRUNNION & THRUST BEARING LUBE OIL	150°F																								Local alarm & input to common trouble alarm 16-XA-153	NA
75	16-XA-153	TRUNNION & THRUST L.O.S. TROUBLE	TROUBLE																						X			0221/12
76	16-TAH-154	FEED CHUTE 102	260°F																						X			0450/14
77	16-ZS-155	BLAST DOOR 101 NOT CLOSED	N/A	X																						X	Stop feed for 16-ZS-155 (DFS-BLDR-101 not closed)	I:115/06
78	16-ZS-156A/C	BLAST DOOR 101 NOT LATCHED	N/A	X																						X	Stop feed for either 16-ZS-156A or -156C not latched.	0273/13
79	16-ZS-159	BLAST DOOR 102 NOT CLOSED	N/A	X																						X	Stop feed for 16-ZS-159 (DFS-BLDR-102 not closed)	I:115/13
80	16-ZS-160A/C/E	BLAST DOOR 102 NOT LATCHED	N/A	X																						X	Stop feed for any of 16-ZS-160A, -160C, or -160E not latched.	0273/14
81	16-PSL-180	MMS-CHUT-101 QUENCH PRESS LOW	30 psig																							X	3 sec delay.	0420/04
82	16-PSL-181	MMS-CHUT-102 QUENCH PRESS LOW	30 psig																							X	3 sec delay.	0420/06
83	16-TAH-182	KILN EXHAUST GAS (PRE-QUENCH)	1600°F																						X		Average of-16-TI-244 & 16-TI-182.	1051/06
84	16-TAHH-182	KILN EXHAUST GAS (PRE-QUENCH)	1650°F	X																						X	Average of-16-TI-244 & 16-TI-182.	1051/06
85	16-TALL-182	KILN EXHAUST GAS (PRE-QUENCH)	950°F	X								X				X										X	RCRA AWFCO. Average of-16-TI-244 & 16-TI-182.	1051/00
86	16-ZS-183	WASTE BIN OUT OF POSITION	N/A	X								X		X		X										X	6-min delay timer from HDC gates closed.	0222/14
87	16-TAH-184	HDC UPPER HEATERS	1200°F																						X			0451/02
88	16-TAHH-184	HDC UPPER HEATERS	1300°F	X								X		X												X		0451/04
89	16-TAL-184	HDC UPPER HEATERS	1050°F																						X			0451/00
90	16-TALL-184	HDC UPPER HEATERS	1000°F	X								X						X								X	RCRA AWFCO. Alarm shuts down HDC drive if in MANUAL. If in AUTO, code control logic will S/D HDC drive at 1000°F (decreasing temp).	0450/16
91	16-PSLL-194	AB #1 FUEL GAS	6.0 osig																				X			X	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/10
92	16-PSHH-195	AB #1 FUEL GAS	2.5 psig																				X			X	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/12
93	16-TSH-197	AFTERBURNER CHAMBER	1500°F			X																				X	Kiln burner light permissive.	1020/16

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TOCDF
ALARM AND INTERLOCK MATRIX (NOTES 1,2)
SYSTEM: DEACTIVATION FURNACE SYSTEM (DFS)

PLC:  ICS-CONR-112
INTERLOCK: I-10
P&IDs: TE-1-D-501,-502,-531/1,-531/2,-533, TE-6-D-509
```

Action column legend:

1. STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
2. OPEN KILN SHROUD AIR DAMPERS
3. CLOSE KILN SHROUD AIR DAMPERS
4. SHUTDOWN KILN BURNER
5. SHUTDOWN KILN COMBUSTION AIR BLOWER / CLOSE COMB. AIR DAMPER
6. SHUTDOWN AFTERBURNER #1
7. SHUTDOWN AFTERBURNER #2
8. SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
9. SHUTDOWN ID FAN / OPEN ID FAN DAMPER
10. SHUTDOWN ID FAN LUBE OIL SYSTEM
11. OSCILLATE ROTARY KILN
12. SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
13. SHUTDOWN KILN DRIVE
14. SHUTDOWN KILN LUBE OIL SYSTEM
15. SHUTDOWN HEATED DISCHARGE CONVEYOR DRIVE
16. SHUTDOWN WATER RETURN PUMP
17. SHUTDOWN BRINE PUMPS
18. SHUTDOWN CLEAN LIQUOR PUMP
19. KILN BURNER LOCKOUT
20. AFTERBURNER #1 LOCKOUT
21. AFTERBURNER #2 LOCKOUT
22. PREALARM
23. ALARM

ITM	TAG NUMBER	DESCRIPTION	SETPOINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	REMARKS	ALARM BIT B001:XX/XX
94	16-TSHH-197	AFTERBURNER CHAMBER EXTREME TEMP	2400°F																				X	X		X	BMS 3-P running interlock for AB #1 & AB #2. See 16-BSLL-850/851 for LOCKOUT interlocks.	1020/14
95	16-TSL-197	AFTERBURNER CHAMBER PURGE BYPASS	1400°F																							X	Input to system purge bypass (see Appendix D for logic).	1020/12
96	16-PAH-201	AFTERBURNER FUEL GAS HEADER	1.5 psig																						X			2250/04
97	16-PAL-201	AFTERBURNER FUEL GAS HEADER	1.0 psig																						X			2250/02
98	16-TAHH-202	MMS-CHUTE-101	280°F	X																					X			0453/02
99	16-TAHH-203	MMS-CHUTE-102	280°F	X																					X			0453/02
100	16-PSHH-204	KILN PRESSURE	-0.1 in wc	X																						X	RCRA AWFCO	0420/10
101	16-XS-207	MMS-CHUT-101 JAM	JAM	X																						X	RCRA AWFCO. 10 sec delay.	0221/14
102	16-XA-208	DFS-CHUT-101 JAM	JAM	X																						X	10 sec delay	0221/16
103	16-XS-209	MMS-CHUT-102 JAM	JAM	X																						X	RCRA AWFCO. 10 sec delay.	0222/00
104	16-XA-210	DFS-CHUT-102 JAM	JAM	X																						X	10 sec delay	0222/02
105	16-PSL-214	TRUNNION & THRUST LOS	30 psig	X												X	X									X	Swithover to backup pump after 10 sec delay. If alarm is active for 30 sec, stop feed and S/D kiln and lube oil system.	0222/04 I:106/10
106	16-PAH-218	KILN BURNER FUEL GAS	2.0 psig																						X			2050/04
107	16-PAL-218	KILN BURNER FUEL GAS	1.0 psig																						X			2050/02
108	16-PAH-229	AFTERBURNER PILOT FUEL GAS	1.99 psig																						X			2250/06
109	16-XA-263	DFS GEARBOX L.O.S. TROUBLE	TROUBLE																							X	40 sec delay.	0222/06
110	16-PAL-283	KILN COMB. AIR PRESS LOW	9 in wc																						X			2050/06
111	16-PSLL-301	AFTERBURNER COMB. AIR	5 in wc																				X			X	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/14
112	16-PSLL-302	AFTERBURNER COMB. AIR	5 in wc																					X		X	3 sec delay. BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/04
113	16-TISH-345	DFS GEARBOX LUBE OIL	180°F																							X	Local alarm & input to common trouble alarm 16-XA-263	NA
114	16-FSL-346	DFS GEARBOX LUBE OIL	0.75 gpm																							X	Local alarm & input to common trouble alarm 16-XA-263	NA
115	16-PSL-349	DFS GEARBOX LUBE OIL	3.0 psig																							X	Local alarm & input to common trouble alarm 16-XA-263	NA
116	16-LSL-350	DFS GEARBOX LUBE OIL	1.5 in	X																						X	3 sec delay. Level above suction.	0222/10
117	16-SAHH-602	KILN SPEED	2.00 rpm	X																						X	RCRA AWFCO	0223/06
118	16-SALL-602	KILN SPEED	0.33 rpm	X																						X	RCRA AWFCO	0223/10
119	16-PDAH-801	TRUNNION FILTER DELTA P.	35 psig																							X	Local alarm & input to common trouble alarm 16-XA-153	NA
120	16-PDAH-802	TRUNNION FILTER DELTA P.	35 psig																							X	Local alarm & input to common trouble alarm 16-XA-153	NA
121	16-FAH-813	AB CHAMBER EXHAUST FLOW	1400 ft3/s	X																						X		1051/10
122	16-KAL-813	AB CHAMBER EXHAUST RESIDENCE TIME	0.0 sec	X																						X		1051/12
123	16-PDAH-813	AB EXHAUST REFR. RING DELTA P.	0.93 in wc	X																						X	RCRA AWFCO	1021/10
124	16-XS-821	HDC SLIDE GATE JAM	JAM	X								X				X										X	RCRA AWFCO. 10 sec delay.	0222/12
125	16-PSHH-832	KILN BURNER PILOT F.G.	21 in wc																							X	3 sec delay.	2020/14
126	16-BSLL-844	KILN BURNER LOCKOUT	LOCKOUT	X			X			X																X	NFPA	2020/12
127	16-BSLL-850	AB#1 LOCKOUT	LOCKOUT	X					X																	X	NFPA	2220/16

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│                   TOCDF                       │
│   ALARM AND INTERLOCK MATRIX (NOTES 1,2)      │
│   SYSTEM: DEACTIVATION FURNACE SYSTEM (DFS)   │
│                                               │
│             PLC:  ICS-CONR-112                │
│             INTERLOCK: I-10                    │
│   P&IDs: TE-1-D-501,-502,-531/1,-531/2,-533,  │
│          TE-6-D-509                            │
└─────────────────────────────────────────────┘
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Column legend (1–23):

1. STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
2. OPEN KILN SHROUD AIR DAMPERS
3. CLOSE KILN SHROUD AIR DAMPERS
4. SHUTDOWN KILN BURNER
5. SHUTDOWN KILN COMBUSTION AIR BLOWER / CLOSE COMB. AIR DAMPER
6. SHUTDOWN AFTERBURNER #1
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11. OSCILLATE ROTARY KILN
12. SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
13. SHUTDOWN KILN DRIVE
14. SHUTDOWN KILN LUBE OIL SYSTEM
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19. KILN BURNER LOCKOUT
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22. PREALARM
23. ALARM

ITM	TAG NUMBER	DESCRIPTION	SETPOINT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	REMARKS	ALARM BIT B001:XX/XX
128	16-BSLL-850/851	AB1 & AB2 LOCKOUT	LOCKOUT	X		X	X		X	X				X												X	NFPA	2220/16 2420/16
129	16-BSLL-851	AB #2 LOCKOUT	LOCKOUT	X						X																X	NFPA	2420/16
130	16-PSHH-852	AFTERBURNER PILOT FUEL GAS	2.5 psig																							X		2221/00
131	16-ZX-854	KILN PURGE COMPLETE	N/A																								Status indication. BMS kiln burner ignition permissive.	2005/07
132	16-ZX-855	KILN PURGING	N/A																								Status indication.	2005/10
133	16-ZX-856	SYSTEM PURGE COMPLETE	N/A																								Status indication. BMS afterburner burner ignition permissive.	2205/07
134	16-ZX-857	SYSTEM PURGING	N/A																								Status indication.	2205/10
135	16-XS-858	KILN BURNER FSSS PANEL E-STOP	N/A	X			X	X						X												X	Local E-stop.	2020/16
136	16-XS-859	AFTERBURNER FSSS PANEL E-STOP	N/A	X					X	X	X			X												X	Local E-stop.	1021/10
137	16-ZS-862A	16-XV-862 DFS ISOLATION VALVE	NOT OPEN					X																				1063/13
138	20-PSLL-117	PLANT AIR DICO	SEE REMARK	X																							See site-specific compressed air system FAWB for setpoint.	B4:17/00
139	20-PSLL-730	INSTRUMENT AIR DICO	SEE REMARK	X																							See site-specific compressed air system FAWB for setpoint.	0205/14
140	71-XS-005	SHIFT SUPERVISOR E-STOP	N/A	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X						X		0220/02
141	71-XS-025	LEAD OPERATOR E-STOP	N/A	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X						X		0220/14
142	71-XS-045	FURNACE OPERATOR #1 E-STOP	N/A	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X						X		0220/16
143	71-XS-065	FURNACE OPERATOR #2 E-STOP	N/A	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X						X		0221/02
144	71-XS-085	DEMIL/FURNACE CONSOLE-STOP	N/A	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X						X		0221/04
145	71-XS-145	DEMIL/FURNACE CONSOLE-STOP	N/A	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X						X	Not shown on P&ID.	NA
146	X16BNCHNG	WASTE BIN FULL PREALARM	90%																						X			022304
147	X16CHNGBN	WASTE BIN FULL	110%	X						X				X												X		0223/00
148	DFS-AQS-FDRT	AGENT/HR FEED RATE EXCEEDED	NOTE 4	X																						X	RCRA AWFCO. Rolling hourly sum (Ref: TEMP-2519-DFS R1)	0279/16
149	RSMAAGNT	RSMA AGENT/HR PREALARM	SEE REMARK																							X	DICO to CONR101A preventing feed of rocket that would exceed RCRA agent feed rate limit (I-lock of RSM pusher past position 1). I-lock for DFS-CHUT-101 manual gate cycle icon.	0206/00
150	RSMBAGNT	RSMB AGENT/HR PREALARM	SEE REMARK																							X	DICO to CONR104A preventing feed of rocket that would exceed RCRA agent feed rate limit (I-lock of RSM pusher past position 1 & extend I-lock for shear cylinder). I-lock for DFS-CHUT-102 manual gate cycle icon.	0206/01
151	DFSPROPR	DFS PROJECTILES/HR PREALARM	SEE REMARK																						X		Projos/hr ROHA plus next burster on RSM >277/hr when processing projos only and >78/hr when coprocessing.	0216/11
152	NA	DFS PROJECTILES/HR I-LOCK DICO	SEE REMARK	X																							Projos/hr ROHA plus next burster on RSM >287/hr when processing projos only and >88/hr when coprocessing. De-energize relay for ECR A asking for gates to be cycled. DICO to CONR101A for shear cylinder extend I-lock & shear blade process water open I-lock.	B4:051/03
153	DFS-PRO-FDRT	DFS PROJECTILES/HR EXCEEDED	SEE REMARK	X																						X	RCRA AWFCO. Projos/hr ROHA. SP is >287/hr when processing projos only and >88/hr when coprocessing.	0215/11

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│                      TOCDF                           │
│      ALARM AND INTERLOCK MATRIX (NOTES 1,2)          │
│     SYSTEM: DEACTIVATION FURNACE SYSTEM (DFS)        │
│                                                      │
│               PLC:  ICS-CONR-112                     │
│               INTERLOCK: I-10                        │
│   P&IDs: TE-1-D-501,-502,-531/1,-531/2,-533, TE-6-D-509 │
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Actions (columns):

1 STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
2 OPEN KILN SHROUD AIR DAMPERS
3 CLOSE KILN SHROUD AIR DAMPERS
4 SHUTDOWN KILN BURNER
5 SHUTDOWN KILN COMBUSTION AIR BLOWER / CLOSE COMB. AIR DAMPER
6 SHUTDOWN AFTERBURNER #1
7 SHUTDOWN AFTERBURNER #2
8 SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
9 SHUTDOWN ID FAN / OPEN ID FAN DAMPER
10 SHUTDOWN ID FAN LUBE OIL SYSTEM
11 OSCILLATE ROTARY KILN
12 SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
13 SHUTDOWN KILN DRIVE
14 SHUTDOWN KILN LUBE OIL SYSTEM
15 SHUTDOWN HEATED DISCHARGE CONVEYOR DRIVE
16 SHUTDOWN WATER RETURN PUMP
17 SHUTDOWN BRINE PUMPS
18 SHUTDOWN CLEAN LIQUOR PUMP
19 KILN BURNER LOCKOUT
20 AFTERBURNER #1 LOCKOUT
21 AFTERBURNER #2 LOCKOUT
22 PREALARM
23 ALARM

ITM	TAG NUMBER	DESCRIPTION	SETPOINT	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	REMARKS	ALARM BIT B001:XX/XX
154	DFSRKTPR	DFS ROCKETS/HR PREALARM	SEE REMARK																						X		SP is >=31/hr when processing rockets only and >=1/hr when coprocessing.	0223/14
155	NA	DFS ROCKETS/HR I-LOCK DICO	SEE REMARK																								SP >=33/hr (rockets only) and >=1/hr (coprocessing). De-energize ECR A/B relays asking for gates to be cycled. I-lock for DFS-CHUT-101/102 manual gate cycle icons. DICO to CONR104A for shear cylinder extend I-lock & shear blade process water open I-lock.	B4:063/03
156	DFS-RK-FDRT	DFS ROCKETS/HR EXCEEDED	SEE REMARK	X																						X	RCRA AWFCO. SP is >33/hr when processing rockets only and >1/hr when coprocessing.	0223/16
157		DICO FROM ICS-CONR-109 - LOSS OF POWER	N/A			X																						B4:25/01

NOTE 1: April 2001 PLC code was used as the basis for alarm setpoints and responses.
NOTE 2: See PAS/PFS FAWB (Programmatic Process FAWB Book 28) for ACAMS and CEMS alarms.
NOTE 3: High order detonation closes the following isolation valves: 16-XV-054, -071, -097A, -285, -286, -403, and 16-XY-003, -052, -053, -178, -179. Also DICO to ICS-CONR-105 to close 18-HDV-119, -219 (B4:67/00).
NOTE 4: GB ROCKETS<17.0 lb/hr, VX ROCKETS<19.0 lb/hr, VX MINES<36.8 lb/hr (Setpoints are for long term incineration; short term incineration rates are lower. See TE-SOP-004) GB ROCKETS limited to10.7 lb/hr during simultaneous processing.

UMCDF DEACTIVATION FURNACE SYSTEM (DFS)

UMCDF DFS　　　　ALARM AND INTERLOCK MATRIX　　　　**UMCDF DFS**

P&IDs: UM-1-D-501, -502, -531/1, -531/2, -533, UM-6-D-509, UM-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Malfunction Outputs	Prealarm Outputs
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SHUTDOWN EMPTY OUT PUMP
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM

Matrix columns are B8:010/ bits (17 16 15 14 13 12 11 10 07 06 05 04 03 02 01 00) for MALFUNCTION outputs and B8:011/ bits (17 16 15 14 13 12 11 10 07 06 05 04 03 02 01 00) for PREALARM outputs.

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	B8:010/ X-bits	B8:011/ X-bits	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX	
1	03 XA 131	MMS-GATE-103 MALFUNCTION	MALF	17, 16		See FAWB Note B-14.	0268/11	**24**	CH 1
2	03 FAH 178	DFS GATES/CHUTES FLOW	3 gpm	17		Sum of water/decon flows to MMS-GATE-101/102 and MMS-CHUT-101/102 (see FAWB Note B-5). AN added 60 s delay. **S/D chute A/B wash system.**	**0453/16**	**134**	CH 1
3	03 XA 231	MMS-GATE-104 MALFUNCTION	MALF	17, 16		See FAWB Note B-14.	0269/11	**24**	CH 1
4	16 XA 001	DFS-GATE-101 MALFUNCTION	MALF	17, 16			0260/11	24	
5	16 XA 002	DFS-GATE-102 MALFUNCTION	MALF	17, 16			0261/11	**24**	CH 1
6	16 TSH 004A-J	TRUNNION & THRUST BEARING	240°F		00	5 sec delay. Alarms on high temp for any of 16 TSH-004A thru -004J	0220/00	NA	
7	16 PSH 007A	HIGH ORDER DETONATION	0.5 psig	17, 14, 13, 12, 07, 06, 05, 03			0220/04	28	CH 1
8	16 PSH 007B	HIGH ORDER DETONATION	0.5 psig	17, 14, 13, 12, 07, 06, 05, 03			0220/06	28	CH 1
9	16 TAH 008	KILN EXHAUST **(AFTER SPRAY)**	**1575°F**		00		1050/02	NA	CH 1
10	16 TAHH 008	KILN EXHAUST **(AFTER SPRAY)**	1600°F	17		RCRA AWFCO DFS-02 **and MACT AWFCO DFS(M)-2**. See NOTE 2.	1050/04	30	CH 1
11	16 TAL 008	KILN EXHAUST **(AFTER SPRAY)**	**990°F**		00		**1051/02**	NA	CH 1
12	16 TALL 008	KILN EXHAUST **(AFTER SPRAY)**	850°F	17		RCRA AWFCO DFS-03 **and MACT AWFCO DFS(M)-3**. See NOTE 2.	1052/10	**30**	CH 1
13	**16 AAH 009**	**KILN EXHAUST O2**	**20.8%**		00	**Measurement is wet basis only.**	**1052/00**	**NA**	CH 1
14	16 AAL 009	KILN EXHAUST O2	**6%**		00	**Measurement is wet basis only.**	**1052/04**	**NA**	CH 1
15	**16 XS 009**	**KILN EXHAUST O2**	**MALF**	17		**Measurement is wet basis only.**	**1020/02**	**NA**	CH 1
16	16 AISH 011	FUEL GAS LEAKAGE TO ROOM	25% LEL	17			0220/10	214	CH 1
17	16 SS 015	KILN HOME POSITION SWITCH	NA			Feed requirement for rockets.	I:110/06	NA	
18	16 PAH 018	KILN PRESSURE	-0.3 in wc		00	20 sec delay. Note: AN deleted time delay.	0450/02	**NA**	CH 1
19	16 PAL 018	KILN PRESSURE	-0.85 in wc		00	20 sec delay. Note: AN deleted time delay.	0450/00	NA	
20	16 XS 019	KILN DISCHARGE CHUTE JAM	JAM	17, 06		10 sec delay.	0220/12	32	
21	16 TAH 020	ROTARY KILN	1150°F		00		0450/06	NA	
22	16 TAHH 020	ROTARY KILN	1300°F	17			0450/10	34	
23	16 TAL 020	ROTARY KILN	1000°F		00		0450/04	NA	
24	16 TALL 020	ROTARY KILN	950°F	17, 06			0453/06	164	
25	16 FFAH 021	KILN BURNER AIR/FUEL	300%EX.AIR		00		2050/04	NA	
26	16 FFAL 021	KILN BURNER AIR/FUEL	15%EX.AIR		00	40 sec delay.	2050/10	NA	
27	16 PSLL 023	FUEL GAS SUPPLY TO KILN BURN	0.75 psig	13		3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/00	**144**	CH 1
28	16 PSHH 025	FUEL GAS SUPPLY TO KILN BURN	1.75 psig	13		3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/02	**144**	CH 1
29	16 PAH 026	KILN BURNER PILOT GAS	1.0 psig		00		2050/00	NA	

UMCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

UMCDF DFS — **UMCDF DFS**

P&IDs: UM-1-D-501, -502, -531/1, -531/2, -533, UM-6-D-509, UM-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Left (Malfunction)	Right (Prealarm)
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SHUTDOWN EMPTY OUT PUMP
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM

ITM NUM	TAG NUMBER			DESCRIPTION	SET POINT	B8:010/ (17-00)	B8:011/ (17-00)	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX	
30	16	PSLL	029	KILN COMB. AIR	20 in wc	X (F13)		3 sec delay. BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2020/04	**144**	CH 1
31	16	XA	040	KILN DRIVE	MALF	X X (F17/F16) ... X (F13)			0266/11	36	
32	16	TAH	042	DFS HEATED DISCHARGE CONV.	1200°F		X		0451/12	NA	
33	16	TAHH	042	DFS HEATED DISCHARGE CONV.	1300°F	X ... X X			0451/14	38	
34	16	TAL	042	DFS HEATED DISCHARGE CONV.	1050°F		X		0451/10	NA	
35	16	TALL	042	DFS HEATED DISCHARGE CONV.	1000°F	X ... X		RCRA AWFCO DFS-08 **and MACT AWFCO DFS(M)-8**. See NOTE 2. If in AUTO, PLC logic will S/D HDC drive at 1000°F (decreasing temp).	0451/06	40	CH 1
36	16	XA	045	DFS HEATED DISCHARGE CONV.	MALF	X ... X X			0263/11	**54**	CH 1
37	16	TAH	051A	KILN SKIN TEMP. #1	1450°F		X		0451/16	NA	
38	16	TAHH	051A	KILN SKIN TEMP. #1	1500°F	X		RCRA AWFCO DFS-06 **and MACT AWFCO DFS(M)-6**. TSCA. (Note: AN deleted delay). See NOTE 2.	0452/00	44	CH 1
39	16	TAH	051B	KILN SKIN TEMP. #2	1450°F		X		0452/02	NA	
40	16	TAHH	051B	KILN SKIN TEMP. #2	1500°F	X		RCRA AWFCO DFS-06 **and MACT AWFCO DFS(M)-6**. TSCA. (Note: AN deleted delay). See NOTE 2.	0452/04	**44**	CH 1
41	16	TAH	051C	KILN SKIN TEMP. #3	1450°F		X		0452/06	NA	
42	16	TAHH	051C	KILN SKIN TEMP. #3	1500°F	X		RCRA AWFCO DFS-06 **and MACT AWFCO DFS(M)-6**. TSCA. (Note: AN deleted delay). See NOTE 2.	0452/10	**44**	CH 1
43	16	TAH	051D	KILN SKIN TEMP. #4	1450°F		X		0452/12	NA	
44	16	TAHH	051D	KILN SKIN TEMP. #4	1500°F	X		RCRA AWFCO DFS-06 **and MACT AWFCO DFS(M)-6**. TSCA. (Note: AN deleted delay). See NOTE 2.	0452/14	**44**	CH 1
45	16	TAH	051E	KILN SKIN TEMP. #5	1450°F		X		0452/16	NA	
46	16	TAHH	051E	KILN SKIN TEMP. #5	1500°F	X		RCRA AWFCO DFS-06 **and MACT AWFCO DFS(M)-6**. TSCA. (Note: AN deleted delay). See NOTE 2.	0453/00	**44**	CH 1
47	16	SSL	057	HDC STOPPED	0 rpm	X ... X		RCRA AWFCO DFS-10 **and MACT AWFCO DFS(M)-10**. See NOTE 2.	0223/12	272	CH 1
48	16	XS	058	HDC UPPER GATE JAM SENSOR	JAM	X ... X X		RCRA AWFCO DFS-09 **and MACT AWFCO DFS(M)-9**. See NOTE 2.	0221/00	54	CH 1
49	16	TSHH	062	KILN ETL	1750°F	X (F13)		BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	0420/00	**144**	CH 1

UMCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

UMCDF DFS (left) · **UMCDF DFS** (right)

P&IDs: UM-1-D-501, -502, -531/1, -531/2, -533, UM-6-D-509, UM-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Function codes (left):

Code	Description
F00	SPARE
F01	CLOSE ISOLATION VALVES (SEE NOTE 1)
F02	SHUTDOWN KILN LUBE OIL
F03	SHUTDOWN HEATED DISCHARGE CONVEYOR
F04	SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
F05	SHUTDOWN KILN DRIVE
F06	OSCILLATE KILN DRIVE
F07	SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
F10	SHUTDOWN AFTERBURNER #2
F11	SHUTDOWN AFTERBURNER #1
F12	SHUTDOWN KILN COMBUSTION AIR BLOWER
F13	SHUTDOWN KILN BURNER
F14	CLOSE KILN SHROUD DAMPERS
F15	OPEN KILN SHROUD DAMPERS
F16	SPARE
F17	STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
	MALFUNCTION

Prealarm codes (right):

Code	Description
P17	SPARE
P16	SPARE
P15	SPARE
P14	SPARE
P13	S/D DEMISTER WATER RETURN PUMP
P12	SWITCHOVER BRINE PUMP TO BACKUP
P11	SWITCHOVER CL LIQ PUMP TO BACKUP
P10	SHUTDOWN EMPTY OUT PUMP
P07	SHUTDOWN BRINE PUMP
P06	SHUTDOWN CLEAN LIQUOR PUMP
P05	SPARE
P04	SPARE
P03	SPARE
P02	SPARE
P01	SHUTDOWN ID FAN 1ST STAGE
P00	SHUTDOWN ID FAN 2ND STAGE
	PREALARM

Bit word groups: **B8:010/** (bits 17–00), **B8:011/** (bits 17–00)

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX
50	16 TSL 062	KILN 1400F RELIGHT	1400°F	Purge bypass not available	0421/04	NA
51	16 TSLL 062	KILN TEMPERATURE	900°F		0420/02	56
52	16 PAH 065	AB CHAMBER PRESSURE	**-0.50 in wc**		**1050/00**	NA
53	16 PAHH 065	AB CHAMBER PRESSURE	-0.1 in wc	RCRA AWFCO DFS-31 **and MACT AWFCO DFS(M)-36**. See NOTE 2.	1050/16	**158**
54	16 PAL 065	AB CHAMBER PRESSURE	-5.0 in wc	15 sec delay.	1050/14	NA
55	16 PSLL 068	FUEL GAS TO AB2	0.75 psig	BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks. **4-sec filtering timer.**	2420/00	**150**
56	16 PSHH 069	FUEL GAS TO AB2	2.5 psig	BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks. **4-sec filtering timer.**	2420/02	**150**
57	16 FSL 076	FEED CHUTE QUENCH FLOW	0.6 gpm	5 sec delay.	0420/12	NA
58	16 FFAH 078	AB#1 FUEL GAS TO CMB AIR RATIO	300%EX.AIR		2250/12	NA
59	16 FFAL 078	AB#1 FUEL GAS TO CMB AIR RATIO	15% EX.AIR	10 sec delay.	2250/10	NA
60	16 FFAH 079	AB#2 FUEL GAS TO CMB AIR RATIO	300%EX.AIR		2450/02	NA
61	16 FFAL 079	AB#2 FUEL GAS TO CMB AIR RATIO	15% EX.AIR	10 sec delay.	2450/00	NA
62	16 TAH 092	AFTERBURNER CHAMBER	**2250°F**		1050/12	NA
63	16 TAHH 092	AFTERBURNER CHAMBER	**2350°F**	RCRA AWFCO DFS-14 **and MACT AWFCO DFS(M)-18**. SPs: 2350°F (rockets), 2150°F (other munitions), **2350°F (surrogates)**. See NOTE 2.	1051/14	**58**
64	16 TAL 092	AFTERBURNER CHAMBER	**2100°F**	Note: alarm is stop feed at TOCDF.	1050/10	**58**
65	16 TALL 092	AFTERBURNER CHAMBER	**2050°F**	RCRA AWFCO DFS-13 **and MACT AWFCO DFS(M)-16**. SPs: 2050°F (rockets), 1850°F (other munitions), **2050°F (surrogates)**. See NOTE 2.	1050/06	58
66	16 TALL 092A	AFTERBURNER CHAMBER	**2050°F**	MACT AWFCO DFS(M)-**17**. ROHA. SPs: 2050°F for rockets, 1850°F for other munitions, **2050°F (surrogates)**. See NOTE 2.	**0022/10**	**58**
67	16 PSL 096	QUENCH WATER TO KILN EXHAUST	40 psig	5 sec delay.	1020/06	**NA**
68	16 IAH 099	HDC DRIVE MOTOR CURRENT	1.8 amp		0250/00	170
69	16 IAH 100	KILN DRIVE MOTOR CURRENT	6.5 amp		0250/02	172
70	16 PAL 106	AFTERBURNER COMBUSTION AIR	9 in wc		2250/00	**NA**
71	16 XA 109	KILN COMBUSTION AIR BLOWER	MALF	BMS 3-P running interlock for kiln burner. See 16-BSLL-844 for LOCKOUT interlocks.	2060/11	**282**

UMCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

UMCDF DFS   **UMCDF DFS**

P&IDs: UM-1-D-501, -502, -531/1, -531/2, -533, UM-6-D-509, UM-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Function (left)	Prealarm/Pump (right)
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SHUTDOWN EMPTY OUT PUMP
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX	
72	16 XA 113	AB COMBUSTION AIR BLOWER	MALF	BMS 3-P running interlock for AB #1 & AB #2. See 16-BSLL-850/851 for LOCKOUT interlocks.	2260/11	**284**	CH 1
73	16 PDISH 148	CYCLONE DELTA PRESS	2 in wc	5 sec delay.	1020/10	232	
74	16 TAH 150	FEED CHUTE 101	260°F		0450/12	NA	
75	16 FSL 151A-J	TRUNNION/THRUST LUBE OIL	400 cu in/min	Local alarm & input to 16-XA-153.	NA	NA	
76	16 LSL 151	TRUN./THRUST LUBE OIL RESER.	8 in	3 sec delay.	0221/10	NA	
77	16 LSLL 151	TRUN./THRUST LUBE OIL RESER.	4 in	3 sec delay.	0221/06	62	
78	16 TSH 151	TRUN./THRUST LUBE OIL	150°F	Local alarm & input to 16-XA-153.	NA	NA	
79	16 XA 153	TRUNNION L.O.S.	TROUBLE	Common trouble alarm.	0221/12	NA	
80	16 TAH 154	FEED CHUTE 102	260°F		0450/14	NA	
81	16 ZS 155	BLAST DOOR 101 NOT CLOSED	N/A		I:115/06	64	
82	16 ZS 156A/C	BLAST DOOR 101 NOT LATCHED	N/A	Stop feed for either 16-ZS-156A or -156C not latched.	0273/13	64	
83	16 ZS 159	BLAST DOOR 102 NOT CLOSED	N/A		I:115/13	66	
84	16 ZS 160A/C/E	BLAST DOOR 102 NOT LATCHED	N/A	Stop feed for any of 16-ZS-160A, -160C, or -160E not latched.	0274/13	66	
85	16 PDAH 172	DECON/WATER FILTER (CHUTE 101)	**10 psid**		0453/10	NA	CH 1
86	16 PDAH 173	DECON/WATER FILTER (CHUTE 102)	**10 psid**		0453/12	NA	CH 1
87	16 PDAH 174	DECON/WATER FILTER (EXH DUCT)	**10 psid**		0453/14	NA	CH 1
88	16 PSL 180	PRW TO MMS-CHUT-101	30 psig	3 sec delay.	0420/04	NA	
89	16 PSL 181	PRW TO MMS-CHUT-102	30 psig	3 sec delay.	0420/06	NA	
90	16 TAH 182	KILN EXHAUST GAS (PRE-QUENCH)	1525°F	SP based on Jan 2001 AN DFS mtg.	1051/04	NA	
91	16 TAHH 182	KILN EXHAUST GAS (PRE-QUENCH)	1900°F	RCRA AWFCO DFS-01 **and MACT AWFCO DFS(M)-1**. See NOTE 2.	1051/06	70	CH 1
92	16 TAL 182	KILN EXHAUST GAS (PRE-QUENCH)	**965°F**		**1051/16**	NA	CH 1
93	16 TALL 182	KILN EXHAUST GAS (PRE-QUENCH)	950°F	RCRA AWFCO DFS-12 **and MACT AWFCO DFS(M)-13**. See NOTE 2.	1051/00	68	
94	16 TALL 182A	KILN EXHAUST GAS (PRE-QUENCH)	950°F	MACT AWFCO DFS(M)-**14**. ROHA. See NOTE 2.	**0022/06**	**68**	CH 1
95	16 ZS 183	WASTE BIN OUT OF POSITION	N/A	6-min delay timer.	0222/14	72	
96	16 TAH 184	HEATED DISCHARGE CONV.	1200°F		0451/02	NA	
97	16 TAHH 184	HEATED DISCHARGE CONV.	1300°F		0451/04	76	
98	16 TAL 184	HEATED DISCHARGE CONV.	1050°F		0451/00	NA	
99	16 TALL 184	HEATED DISCHARGE CONV.	1000°F	Note: RCRA at AN and TE. If in AUTO, PLC logic will S/D HDC drive at 1000°F (decreasing temp).	0450/16	74	CH 1

UMCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

UMCDF DFS   **UMCDF DFS**

P&IDs: UM-1-D-501, -502, -531/1, -531/2, -533, UM-6-D-509, UM-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Malfunction (F-codes)	Prealarm (P-codes)
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SHUTDOWN EMPTY OUT PUMP
F10-SHUTDOWN AFTERBURN #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM

ITM NUM	TAG NUMBER			DESCRIPTION	SET POINT	B8:010/ B8:011/ matrix	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX	
100	16	PSLL	194	AB#1 FUEL GAS	0.75 psig	X	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/10	**160**	CH 1
101	16	PSHH	195	AB#1 FUEL GAS	2.5 psig	X	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/12	**160**	CH 1
102	16	**TSL**	197	FURN-102 KILN LIGHT PERM.	1500°F	X ... X	Kiln burner light permissive.	1020/16	78	CH 1
103	16	TSHH	197	AFTERBURNER CHAMBER (ETL)	2400°F	X X	BMS 3-P running interlock for AB #1 & #2. See 16-BSLL-850/851 for LOCKOUT interlocks.	1020/14	**146**	CH 1
104	16	**TSLL**	197	AFTRBRNR CHAMBER RELIGHT	1400°F	X	Input to system purge bypass (see Appendix D for logic).	1020/12	NA	CH 1
105	16	PAH	201	FURN-102 MAIN FUEL GAS	1.5 psig	X		2250/04	NA	
106	16	PAL	201	FURN-102 MAIN FUEL GAS	1.0 psig	X		2250/02	NA	
107	16	TAHH	202	MMS-CHUT-101	280°F	X		0453/02	80	
108	16	TAHH	203	MMS-CHUT-102	280°F	X		0453/04	**80**	CH 1
109	16	PSHH	204	KILN CHAMBER PRESSURE	-0.1 in wc	X	RCRA AWFCO DFS-05 **and MACT AWFCO DFS(M)-5.**	0420/10	176	CH 1
110	16	XS	207	MMS-CHUT-101 ABOVE GATE-101	JAM	X	RCRA AWFCO DFS-04 **and MACT AWFCO DFS(M)-4.** See NOTE 3.	0221/14	84	CH 1
111	16	XA	208	DFS-CHUT-101 BELOW GATE-101	JAM	X	10 sec delay.	0221/16	86	
112	16	XS	209	MMS-CHUT-102 ABOVE GATE-102	JAM	X	RCRA AWFCO DFS-04 **and MACT AWFCO DFS(M)-4.** See NOTE 3.	0222/00	**84**	CH 1
113	16	XA	210	DFS-CHUT-102 BELOW GATE-102	JAM	X	10 sec delay.	0222/02	**86**	CH 1
114	16	PSL	214	DFS-LUBE OIL SYS.	30 psig	X X X	Swithover to backup pump after 10 sec delay. If alarm is active for 30 sec, stop feed and S/D kiln and lube oil system. **S/D kiln if both pumps not running.**	I:106/10 0222/04	92	CH 1
115	16	PAH	218	FURN-101 MAIN FUEL GAS	2.0 psig	X		2050/04	NA	
116	16	PAL	218	FURN-101 MAIN FUEL GAS	1.0 psig	X		2050/02	NA	
117	16	PAH	229	FURN-102 PILOT FUEL GAS	**2.0 psig**	X		2250/06	NA	
118	**16**	**PSL**	**260**	**CCTV-160 CLNG AIR**	**70 psig**	X		**0223/10**	**NA**	CH 1
119	**16**	**PSL**	**261**	**CCTV-161 CLNG AIR**	**70 psig**	X		**0223/14**	**NA**	CH 1
120	16	**XS**	263	DFS GEARBOX L.O.S.	TROUBLE	X	40 sec delay.	0222/06	NA	CH 1
121	16	PAL	283	KILN COMB. AIR LOW PRESS.	**25 in wc**	X		2050/06	NA	
122	16	PSLL	301	AFTERBURNER #1 COMB. AIR	5 in wc	X	3 sec delay. BMS 3-P running interlock for AB #1. See 16-BSLL-850 for LOCKOUT interlocks.	2220/14	**160**	CH 1

UMCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

UMCDF DFS (left) **UMCDF DFS** (right)

P&IDs: UM-1-D-501, -502, -531/1, -531/2, -533, UM-6-D-509, UM-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Function outputs (left column):

- F00-SPARE
- F01-CLOSE ISOLATION VALVES (SEE NOTE 1)
- F02-SHUTDOWN KILN LUBE OIL
- F03-SHUTDOWN HEATED DISCHARGE CONVEYOR
- F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS
- F05-SHUTDOWN KILN DRIVE
- F06-OSCILLATE KILN DRIVE
- F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER
- F10-SHUTDOWN AFTERBURNER #2
- F11-SHUTDOWN AFTERBURNER #1
- F12-SHUTDOWN KILN COMBUSTION AIR BLOWER
- F13-SHUTDOWN KILN BURNER
- F14-CLOSE KILN SHROUD DAMPERS
- F15-OPEN KILN SHROUD DAMPERS
- F16-SPARE
- F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)
- MALFUNCTION

Function outputs (right column):

- P17-SPARE
- P16-SPARE
- P15-SPARE
- P14-SPARE
- P13-S/D DEMISTER WATER RETURN PUMP
- P12-SWITCHOVER BRINE PUMP TO BACKUP
- P11-SWITCHOVER CL LIQ PUMP TO BACKUP
- P10-SHUTDOWN EMPTY OUT PUMP
- P07-SHUTDOWN BRINE PUMP
- P06-SHUTDOWN CLEAN LIQUOR PUMP
- P05-SPARE
- P04-SPARE
- P03-SPARE
- P02-SPARE
- P01-SHUTDOWN ID FAN 1ST STAGE
- P00-SHUTDOWN ID FAN 2ND STAGE
- PREALARM

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	B8:010/ (X marks)	B8:011/ (X marks)	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX	
123	16 PSLL 302	AFTERBURNER #2 COMB. AIR	5 in wc	X (13)		3 sec delay. BMS 3-P running interlock for AB #2. See 16-BSLL-851 for LOCKOUT interlocks.	2420/04	**162**	CH 1
124	16 TISH 345	DFS GEARBOX LUBE OIL	**200°F**			Local alarm & input to 16-XA-263.	NA	NA	CH 1
125	16 FSL 346	DFS GEARBOX LUBE OIL	0.75 gpm			Local alarm & input to 16-XA-263.	NA	NA	
126	16 PSL 349	DFS GEARBOX LUBE OIL	3.0 psig			Local alarm & input to 16-XA-263.	NA	NA	
127	16 LSL 350	DFS GEARBOX LUBE OIL	1.5 in	X (17)		3 sec delay. Level above suction.	0222/10	178	
128	16 SAH 602	KILN SPEED	**2.01 rpm**		X (00)		**0250/04**	NA	CH 1
129	16 SAHH 602	KILN SPEED	**2.06 rpm**	X (17)		RCRA AWFCO DFS-28 **and MACT AWFCO DFS(M)-34. See NOTE 2.**	0250/10	260	
130	16 SAL 602	KILN SPEED	**0.50 rpm**		X (00)	Shown on UM-1-D-531	**0251/00**	NA	CH 1
131	16 SALL 602	KILN SPEED	0.33 rpm	X (17)		Alarm is not shown on UM-1-D-531/1 but is in baseline code. RCRA at AN and TE.	**0250/06**	**260**	CH 1
132	16 PDAH 801	TRUNNION FILTER DELTA PRESS.	35 psig			Local alarm & input to 16-XA-153.	NA	NA	
133	16 PDAH 802	TRUNNION FILTER DELTA PRESS.	35 psig			Local alarm & input to 16-XA-153.	NA	NA	
134	16 FAH 813	FURN-102 EXHAUST FLOW	1400 ft3/sec	X (17)			1051/10	**96**	CH 1
135	16 KAL 813	FURN-102 EXHAUST RESIDE TIME	2.0 sec	X (17)		SP based on Jan 2001 AN DFS mtg.	1051/12	96	
136	16 PDAH 813	AB CHAMBER EXHAUST DELTA P	**2.50 in wc**		X (00)		**1052/12**	NA	CH 1
137	16 PDAH 813A	AB CHAMBER EXHAUST DELTA P	**2.75 in wc**	X (17)		MACT AWFCO DFS(M)-**12**. ROHA. See NOTE 2.	**0022/04**	**190**	CH 1
138	16 PDAHH 813	AB CHAMBER EXHAUST DELTA P	**2.75 in wc**	X (17)		RCRA AWFCO DFS-11 **and MACT AWFCO DFS(M)-13.** See NOTE 2.	1052/06	190	
139	16 XS 821	HDC LOWER GATE	JAM	X (17) X (05) X (03)		RCRA AWFCO DFS-09 **and MACT AWFCO DFS(M)-9.** See NOTE 2.	0222/12	100	
140	16 PSHH 832	FURN-101 PILOT F.G.	**1.5 psig**		X (00)	3 sec delay.	2020/14	NA	CH 1
141	16 BSLL 844	KILN BURNER	LOCKOUT	X (17) X (13) X (05)		RCRA AWFCO DFS-34 **and MACT AWFCO DFS(M)-37.** See NOTE 2.	2020/12	102	CH 1
142	16 BSLL 850	AFTERBURNER #1	LOCKOUT	X (17) X (12)		NFPA.	2220/16	104	
143	16 BSLL 850/1	AB1 & AB2 LOCKOUT	LOCKOUT	X (17) X (14) X (13) X (06) X (05) X (03)		RCRA AWFCO DFS-07 **and MACT AWFCO DFS(M)-7.** See NOTE 2.	2220/16 **2420/06**	22	CH 1
144	16 BSLL 851	AFTERBURNER #2	LOCKOUT	X (17) X (12)		NFPA.	2420/06	106	
145	16 PSHH 852	AFTERBURNER PILOT FUEL GAS	2.5 psig			3 sec delay.	2221/00	NA	
146	16 XS 858	KILN BURNER MANAG. PANEL	E-STOP	X (17) X (14) X (13) X (05)		Local E-stop.	2020/16	108	
147	16 XS 859	AFTBNR BURNER MANAG. PANEL	E-STOP	X (17) X (14) X (13) X (12) X (11) X (05)		Local E-stop.	1021/10	110	
148	**16 PSLL 863**	**XV-863 OPEN PERMISSIVE**	**-6 IN WC**		X (01) X (00)	**See FAWB 28, p. D-15 AN only; should this have an alarm?**	1022/16	**61**	CH 1
149	20 PSLL 117	PLANT AIR NOT AVAILABLE (DICO)	**90 psig**	X (17)		See site-specific compressed air system FAWB for setpoint.	**0005/01 B4:17/00**	224	CH 1

UMCDF DEACTIVATION FURNACE SYSTEM (DFS)
ALARM AND INTERLOCK MATRIX

UMCDF DFS (left) **UMCDF DFS** (right)

P&IDs: UM-1-D-501, -502, -531/1, -531/2, -533, UM-6-D-509, UM-6-H-504; PLC: ICS-CONR-112, , INTERLOCK I-10

Function (left)	Process (right)
F00-SPARE	P17-SPARE
F01-CLOSE ISOLATION VALVES (SEE NOTE 1)	P16-SPARE
F02-SHUTDOWN KILN LUBE OIL	P15-SPARE
F03-SHUTDOWN HEATED DISCHARGE CONVEYOR	P14-SPARE
F04-SHUTDOWN HEATED DISCHARGE CONVEYOR HEATERS	P13-S/D DEMISTER WATER RETURN PUMP
F05-SHUTDOWN KILN DRIVE	P12-SWITCHOVER BRINE PUMP TO BACKUP
F06-OSCILLATE KILN DRIVE	P11-SWITCHOVER CL LIQ PUMP TO BACKUP
F07-SHUTDOWN AFTERBURNER COMBUSTION AIR BLOWER	P10-SHUTDOWN EMPTY OUT PUMP
F10-SHUTDOWN AFTERBURNER #2	P07-SHUTDOWN BRINE PUMP
F11-SHUTDOWN AFTERBURNER #1	P06-SHUTDOWN CLEAN LIQUOR PUMP
F12-SHUTDOWN KILN COMBUSTION AIR BLOWER	P05-SPARE
F13-SHUTDOWN KILN BURNER	P04-SPARE
F14-CLOSE KILN SHROUD DAMPERS	P03-SPARE
F15-OPEN KILN SHROUD DAMPERS	P02-SPARE
F16-SPARE	P01-SHUTDOWN ID FAN 1ST STAGE
F17-STOP FEED (REMOVE FURNACE NORMAL DICO TO 101 A/C & 104A)	P00-SHUTDOWN ID FAN 2ND STAGE
MALFUNCTION	PREALARM

ITM NUM	TAG NUMBER	DESCRIPTION	SET POINT	B8:010 / B8:011	REMARKS	ALARM BIT B001:XX/XX	MASK WORD B8:XX	
150	20 PSLL 730	INSTRUMENT AIR NOT AVAILABLE (DIC	**90 psig**	X	See site-specific compressed air system FAWB for setpoint.	0205/14 **B4:17/01**	**224**	CH 1
151	71 XS 005	SHIFT SUPER CONSOLE	E-STOP	X X X X X X X **X** X X ... X X		0220/02	20	CH 1
152	71 XS 025	LEAD OPER. CONSOLE	E-STOP	X X X X X X X **X** X X ... X X		0220/14	20	CH 1
153	71 XS 045	FURN. OPER. #1 CONSOLE	E-STOP	X X X X X X X **X** X X ... X X		0220/16	20	CH 1
154	71 XS 065	FURN. OPER. #2 CONSOLE	E-STOP	X X X X X X X **X** X X ... X X		0221/02	20	CH 1
155	71 XS 085	DEMIL/FURN OPER CONSOLE	E-STOP	X X X X X X X **X** X X ... X X		0221/04	20	CH 1
156	71 XS 145	DEMIL/FURN OPER CONSOLE	E-STOP	X X X X X X X **X** X X ... X X		0222/16	20	CH 1
157	PREP CHANGE	WASTE BIN CHANGEOUT PREALARM	4 min	X		0223/04	NA	
158	CHANGE BIN	ROCKETS IN BIN	>65		Start 6-min bin changeout timer.	0223/00	NA	
159	NA	MUNITIONS PER HOUR PREALARM	**39/hr**	X	**SP of 39/hr for rockets.**	**0205/17**	NA	CH 1
160	NA	MUNITIONS PER HOUR	**40/hr**	X	RCRA AWFCO DFS-17 and MACT AWFCO DFS(M)-**24**. ROHA. See **NOTES 2 and 4. SP for Rockets.**	**0223/16**	**280**	CH 1
161	NA	AGENT FEEDRATE PER HOUR	SEE REMARKS	X	**RCRA** AWFCO DFS(M)-**17 and MACT AWFCO DFS(M)-24**. ROHA. SPs: **825** lb/hr surrogate; 36.7 lb/hr VX; 21.3 lb/hr GB. See NOTE 2.	**0250/16**	**278**	CH 1

NOTE 1: High order detonation closes the following isolation valves: 16-XV-054, -071, -097A, -171, -285, -286, -403, and 16-XY-003, -052, -053, -178, -179. Also DICO to ICS-CONR-105 to close 18-HDV-119, -219 (B4:67/00).

NOTE 2: RCRA AWFCOs are based on UMAP815DFS and MACT AWFCOs are based on UMUF872DFS.

NOTE 3: The CEMS configuration in the A&I matrix reflects changes decribed in UMAC908MON R2. The DFS kiln exhaust O2 monitor alarm setpoint is from approved RFI S-ALL-249. CEMS alarms associated with monitors downstream of the DFS afterburner are included in the PAS/PFS FAWB, Book 28. ACAMS alarms are also in the PAS/PFS FAWB.

NOTE 4: DFS RCRA munition feedrates: M121A1 (GB,VX): 120/hr, M426 (GB,VX): 47/hr, Land Mine: 70/hr, M55 rocket (GB,VX): 40/hr, Surrogate: 825 lb/hr.

APPENDIX D

PLC Automatic Control Sequences

Appendix D contains a summary of PLC automatic control sequences based on the current versions of the PLC code for each of the sites. This appendix also includes descriptions of the burner management system (BMS) circuit logic for the DFS kiln and afterburner.

The PLC automatic control sequence summaries were generated based on the control system rung ladders in the PLC code for the TOCDF DFS furnace. The operator interface with the PLCs, the Advisor PC system, stores device information in a database that consists of *tags*, or database records used for storing all necessary information related to a device that is monitored or controlled by the Advisor PC system. **D6** tags are used for discrete devices that may be controlled from the Control Room. In this appendix, automatic control for all devices with **D6** tags are described, grouped by the Advisor PC screens on which they appear. Details related to **D6** device format can be found in the CSDP Control Systems Software Design Guide. Note that Advisor PC tag numbers may not match P&ID tag numbers exactly since Advisor PC tag numbers are labels in the code that refer to a device that may be more encompassing than the P&ID device.

Because the DFS PLC automatic control sequences are or will be similar for all four sites, the control sequences are listed in a single table for each screen (Tables D.2 thru D.6) with annotations in the description for each device that indicate the differences, if any, between the control for the device at the different sites. Similarly, the BMS control logic summaries are listed in a single table (Table D.7) with annotations indicating any site-specific differences.

D.1   DFS PLC Automatic Control Sequences

Specific site code currently exists for *ANCDF and* TOCDF. The Equipment Installation Contractor (EIC) is developing site-specific code for UMCDF, and PBCDF. At *all sites*, control for the DFS kiln and afterburner is *or will be* provided by ICS-CONR-112. Because the DFS is fed from two similar chutes from the ECRs, similar devices exist for each of the chutes. Control sequences for analogous devices for each of the two feed chutes are listed in following tables, with the device identifiers (e.g., tag numbers, component numbers) for line B enclosed in brackets []. Similarly, for other devices which have an identical counterpart (e.g., DFS-BLDR-101 Building Door), the control logic for one of the devices is listed with the device identifiers for the analogous device enclosed in []. The information in the tables is based on the *ANCDF and* TOCDF control system rung ladders as *April 2001.*

The TOCDF DFS has 12 Advisor PC screens associated with its operation. Six of the screens are associated with operation of the DFS PAS. *The ANCDF DFS has 14 Advisor PC screens associated with its operation. Eight of the screens are associated with DFS*

PAS/PFS operation. Control sequences associated with *the TOCDF PAS screens and the ANCDF PAS/PFS screens* are described in the PAS/PFS Programmatic Process FAWB, Book 28. The six screens described in this appendix for the DFS are listed in Table D.1.

Table D.1   *ANCDF and* TOCDF DFS Advisor PC Screens

Advisor PC Screen Name	Process Screen Designation
DFS Material Handling	DFM
DFS Furnace Temperature	DFT
DFS Furnace Afterburner	DFA
DFS Kiln Burner	DFK
DFS Afterburner Burner #1 [#2]	DF1 [DF2]

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFM**

Device:	**DFS-GATE-101 ECR-A Blast Chute**
Advisor PC Tag:	X16HS001
CONR:	C112
Driver Word:	0260
Driver Type:	9
Auto Open:	The auto open relay will be active if all of the following conditions are satisfied:
	• "Line A Feed Chute Gate Cycle" relay (see below) is active or the DFS-GATE-101 auto open relay (latch) is active
	• DFS-GATE-101 open timer is not expired
	• 03-ZS-131B (MMS-GATE-103 closed) is made
Auto Close:	The auto close relay will be active if the following condition is satisfied:
	• DFS-GATE-101 auto open relay is not active
Open I-Lock:	Either of the following conditions must be satisfied to allow the device to open:
	• 03-ZS-131B (MMS-GATE-103 closed) is made and 03-ZS-131A (MMS-GATE-103 open) is not made
	• MMS-GATE-103 malfunction alarm is active
Close I-Lock:	None
Relay:	The "Line A Feed Chute Gate Cycle" relay (see above) is latched when the following conditions are satisfied:
	• "Cycle ECR-A Charge Gates" relay (see below) is active
	• MMS-GATE-103 open timer is not expired
	The "Line A Feed Chute Gate Cycle" relay (see above) is unlatched when DFS-GATE-101 auto open relay becomes active *or (TE only)"Stop Waste Feed" Deathwish is active (see A&I Matrix)*

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFM**

Relay:	The "Cycle ECR-A Charge Gates" relay (see above) is latched when the following conditions are satisfied: • *(AN only)* Kiln home switch (window) timer timing • *(TE only) Seal-in bit until start feed initiate is not active* • Either of the following • "ECR-A is selected as the primary feed source (asked first)" relay (see below) is active and "ECR-A is ready for gates to be cycled (asking)" relay (see below) is active • "Manual gate cycle for ECR-A waste" driver is active The "Cycle ECR-A Charge Gates" relay (see above) is unlatched when the "Reset Request for ECR-A Gates Cycle" relay (see below) becomes active *(one-shot) or (TE only)"Stop Waste Feed" Deathwish is active (see A&I Matrix)*
Relay:	The "Reset Request for ECR-A Gates Cycle" relay (see above) becomes active when either of the following conditions are satisfied: • 16-ZS-001A *at TE, 16-ZS-080A at AN* (DFS-GATE-101 open) is made • DFS-GATE-101 open timer is expired and 03-ZS-131A (MMS-GATE-103 open) is not made
Relay:	The "ECR-A is selected as the primary feed source (asked first)" relay (see above) is latched when the following conditions are satisfied: • Any of the following • "Fuze Section of Rocket (or projectile burster) is on Upper Gate" (DICO from CONR101A) is active • "Burster Section of Rocket is on Upper Gate" (DICO from CONR101A) is active • "Motor Section of Rocket is on Upper Gate" (DICO from CONR101A) is active • "Stop Waste Feed" Deathwish is not active (see A&I Matrix) • "RHS-RSM-101 Watch dog time out" (DICO from CONR101A) is not active • *(AN only)* "DFS Rockets/HR" *limit reached* is not active • *(TE only) "DFS Rockets/HR" I-lock limit reached is not active or projos selected (DICO from CONR101A.)* • *(TE only) "DFS Projos/HR" limit reached is not active* • "ECR-B is selected as the primary feed source (asked first)" relay is not active The "ECR-A is selected as the primary feed source (asked first)" relay (see above) is unlatched when any of the following conditions are satisfied: • "RHS-RSM-101 Watchdog timeout" (DICO from CONR101A) is active

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFM**	

	• Primary ECR timer has expired and "ECR-A is ready for gates to be cycled (asking)" relay (see below) is not active
	• All of the following
	    • Kiln home switch (window) timer not timing
	    • "Motor Section of Rocket is on Upper Gate" (DICO from CONR101A) is active
	    • "MMS-GATE-103 (ECR-A) open driver is active
	    • "ECR-A is ready for gates to be cycled (asking)" relay (see below) is not active

Relay:	The "ECR-A is ready for gates to be cycled (asking)" relay (see above) will be active when the following conditions are satisfied:
	• Any of the following
	    • "Fuze Section of Rocket (or projectile burster) is on Upper Gate" (DICO from CONR101A) is active
	    • "Burster Section of Rocket is on Upper Gate" (DICO from CONR101A) is active
	    • "Motor Section of Rocket is on Upper Gate" (DICO from CONR101A) is active
	• "Stop Waste Feed" Deathwish is not active (see A&I Matrix)
	• "RHS-RSM-101 Watch dog time out" (DICO from CONR101A is not active
	• *(AN only)* "DFS Rockets/HR" *limit reached* is not active
	• *(TE only) "DFS Rockets/HR" I-lock limit reached is not active or projos selected (DICO from CONR101A.)*
	• *(TE only) "DFS Projos/HR" limit reached is not active*

Device:	**DFS-GATE-102 ECR-B Blast Chute**
Advisor PC Tag:	X16HS002
CONR:	C112
Driver Word:	0261
Driver Type:	9
Auto Open:	The auto open relay will be active if all of the following conditions are satisfied: • "Line B Feed Chute Gate Cycle" relay (see below) is active or the DFS-GATE-102 auto open relay (latch) is active • DFS-GATE-102 open timer is not expired • 03-ZS-231B (MMS-GATE-104 closed) is made
Auto Close:	The auto close relay will be active if the following condition is satisfied: • DFS-GATE-102 auto open relay is not active
Open I-Lock:	Either of the following conditions must be satisfied to allow the device to open: • 03-ZS-231B (MMS-GATE-104 closed) is made and 03-ZS-231A (MMS-GATE-104 open) is not made • MMS-GATE-104 malfunction alarm is active

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFM**

Close I-Lock:	None
Relay:	The "Line B Feed Chute Gate Cycle" relay (see above) is latched when the following conditions are satisfied: • "Cycle ECR-B Charge Gates" relay (see below) is active • MMS-GATE-104 open timer is not expired The "Line B Feed Chute Gate Cycle" relay (see above) is unlatched when the DFS-GATE-102 auto open relay becomes active *or (TE only)"Stop Waste Feed" Deathwish is active (see A&I Matrix)*
Relay:	The "Cycle ECR-B Charge Gates" relay (see above) is latched when the following conditions are satisfied: • Kiln home switch (window) timer timing • *(TE only) Seal-in bit until start feed initiate is not active* • Either of the following • "ECR-B is selected as the primary feed source (asked first)" relay (see below) is active and "ECR-B is ready for gates to be cycled (asking)" relay (see below) is active • "Manual gate cycle for ECR-B waste" driver is active The "Cycle ECR-B Charge Gates" relay (see above) is unlatched when the "Reset Request for ECR-B Gates Cycle" relay (see below) becomes active *(one-shot) or (TE only)"Stop Waste Feed" Deathwish is active (see A&I Matrix)*
Relay:	The "Reset Request for ECR-B Gates Cycle" relay (see above) becomes active when either of the following conditions are satisfied: • 16-ZS-002A *at TE, 16-ZS-081A at AN* (DFS-GATE-102 open) is made • DFS-GATE-102 open timer is expired and 03-ZS-231A (MMS-GATE-104 open) is not made
Relay:	The "ECR-B is selected as the primary feed source (asked first)" relay (see above) is latched when the following conditions are satisfied: • Any of the following • "Fuze Section of Rocket (or projectile burster) is on Upper Gate" (DICO from CONR104A) is active • "Burster Section of Rocket is on Upper Gate" (DICO from CONR104A) is active • "Motor Section of Rocket is on Upper Gate" (DICO from CONR104A) is active • "Stop Waste Feed" Deathwish is not active (see A&I Matrix) • "RHS-RSM-102 Watch dog time out" (DICO from CONR104A) is not active • *(AN only)* "DFS Rockets/HR" *limit reached* is not active

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFM**

	• *(TE only) "DFS Rockets/HR" I-lock limit reached is not active*
	• "ECR-A is selected as the primary feed source (asked first)" relay is not active
	
	The "ECR-B is selected as the primary feed source (asked first)" relay (see above) is unlatched when any of the following conditions are satisfied:
	• "RHS-RSM-102 Watchdog timeout" (DICO from CONR104A) is active
	• Primary ECR timer has expired and "ECR-B is ready for gates to be cycled (asking)" relay (see below) is not active
	• All of the following
	   • Kiln home switch (window) timer not timing
	   • "Motor Section of Rocket is on Upper Gate" (DICO from CONR104A) is active
	   • "MMS-GATE-104 (ECR-B) open driver is active
	   • "ECR-B is ready for gates to be cycled (asking)" relay (see below) is not active

Relay:	The "ECR-B is ready for gates to be cycled (asking)" relay (see above) will be active when the following conditions are satisfied:
	• Any of the following
	   • "Fuze Section of Rocket (or projectile burster) is on Upper Gate" (DICO from CONR104A) is active
	   • "Burster Section of Rocket is on Upper Gate" (DICO from CONR104A) is active
	   • "Motor Section of Rocket is on Upper Gate" (DICO from CONR104A) is active
	• "Stop Waste Feed" Deathwish is not active (see A&I Matrix)
	• "RHS-RSM-102 Watch dog timeout" (DICO from CONR104A) is not active
	• *(AN only)* "DFS Rockets/HR" *limit reached* is not active
	• *(TE only) "DFS Rockets/HR" I-lock limit reached is not active*

Device:	**DFS-CNVX-101 HDC Conveyor**
Advisor PC Tag:	X16HS044
CONR:	C112
Driver Word:	0263
Driver Type:	7
Auto Slow:	*The auto start (slow speed) relay will be active if the following conditions are satisfied:* • *DFS-CNVX-101 HDC Conveyor Manual Start Slow is active or DFS-CNVX-101 HDC Conveyor Auto Slow is active* • *DFS-FURN-102 Temperature Kiln Light Permissive (set when 16-TIT-197 rises above 1500 °F, reset when 16-TIT-197 lowers below 1000 °F)*

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFM**

	• *DFS-CNVX-101A HDC Lower Heater Bank Temperature Permissive (set when16-TIT-042 rises above 1010 °F, reset when 16-TIT-042 lowers below 1000 °F)* • *DFS-CNVX-101B HDC Upper Heater Bank Temperature Permissive (set when16-TIT-184 rises above 1010 °F, reset when 16-TIT-184 lowers below 1000 °F)* • *DFS-CNVX-101 HDC Conveyor Manual Start Fast is not active*
Auto Fast:	The auto start (fast speed) relay will be active if the following conditions are satisfied: • *DFS-CNVX-101 HDC Conveyor Manual Start Fast is active or DFS-CNVX-101 HDC Conveyor Auto Fast is active* • DFS-FURN-102 Temperature Kiln Light Permissive (set when16-TIT-197 rises above 1500 °F, reset when 16-TIT-197 lowers below 1000 °F) • DFS-CNVX-101A HDC Lower Heater Bank Temperature Permissive (set when 16-TIT-042 rises above 1010 °F, reset when 16-TIT-042 lowers below 1000 °F) • DFS-CNVX-101B HDC Upper Heater Bank Temperature Permissive (set when16-TIT-184 rises above 1010 °F, reset when 16-TIT-184 lowers below 1000 °F) • *DFS-CNVX-101 HDC Conveyor Manual Start Slow is not active*
Slow I-Lock:	The following condition must be satisfied to allow the device to operate in slow speed: • Shut down HDC Conveyor Deathwish (see A&I Matrix) is not active
Fast I-Lock:	The following condition must be satisfied to allow the device to operate in fast speed: • Shut down HDC Conveyor Deathwish (see A&I Matrix) is not active
Device: Advisor PC Tag: CONR: Driver Word: Driver Type:	**RHA-CHUT-101 Catch Pan** X16XY047 C112 0264 3
Auto Open:	The auto open relay will be active if the following condition is satisfied: • Waste Bin Change-out driver is not active
Open I-Lock:	The following condition must be satisfied to allow the device to open: • CON E-Stop is not active

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFM**

Device:	**RHA-CHUT-101 Lower Discharge Gate**
Advisor PC Tag:	X16XY061
CONR:	C112
Driver Word:	0265
Driver Type:	3
Auto Open:	The auto open relay will be active if the following condition is satisfied:
	• Waste Bin Change-out is not in progress
Open I-Lock:	The following conditions must be satisfied to allow the device to open:
	• CON E-Stop is not active
	• 16-ZS-183 (Waste Bin present) is made

Device:	**DFS-FURN-101 Kiln Drive**
Advisor PC Tag:	X16HS038
CONR:	C112
Driver Word:	0266
Driver Type:	1
Auto Start:	The auto start relay will be active if the following condition is satisfied:
	• DFS-FURN-102 Temperature Kiln Light Permissive (set when16-TIT-197 rises above 1500 °F, reset when 16-TIT-197 lowers below 1000 °F)
Start I-Lock:	The following condition must be satisfied to allow the device to operate:
	• Shut down Kiln Drive Deathwish (see A&I Matrix) is not active

Device:	**DFS-FURN-101 Lube Oil Pump B [Pump C]**
Advisor PC Tag:	X16LO101B [X16LO101C]
CONR:	C112 [C112]
Driver Word:	0267 [0262]
Driver Type:	1
Auto Start:	The auto start relay will be active if both of the following conditions are satisfied:
	• Either of the following
	• DFS-FURN-102 Temperature Kiln Light Permissive (set when16-TIT-197 rises above 1500 °F, reset when 16-TIT-197 lowers below 1000 °F)
	• DFS-FURN-101 Lube Oil Pump B [Pump C] is running
	• Either of the following
	• DFS-FURN-101 Lube Oil Pump B [Pump C] is PRIMARY and "DFS-FURN-101 Lube Oil Pump Auto Switchover" timer (see below) has not expired
	• DFS-FURN-101 Lube Oil Pump C [Pump B] is primary and "DFS-FURN-101 Lube Oil Pump Auto Switchover" (see below) relay is active

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFM**

Start I-Lock:	The following condition must be satisfied to allow the device to operate: • Shut down Kiln Lube Oil System Deathwish (see A&I Matrix) is not active

Relay:	The "DFS-FURN-101 Lube Oil Pump Auto Switchover" relay (see above) is latched when any of the following conditions are satisfied:
	• 16-PSL-214 (DFS-FURN-101 Trunnion Lube Oil system pressure low) is active on time delay after pump start and either of the following
	      • DFS-FURN-101 Lube Oil Pump B is PRIMARY and running
	      • DFS-FURN-101 Lube Oil Pump C is PRIMARY and running
	• DFS-FURN-101 Lube Oil Pump B is PRIMARY and in malfunction
	• DFS-FURN-101 Lube Oil Pump C is PRIMARY and in malfunction
	The "DFS-FURN-101 Lube Oil Pump Auto Switchover" relay (see above) is unlatched when both of the following conditions are satisfied:
	• DFS-FURN-101 Lube Oil Pump B is in MANUAL
	• DFS-FURN-101 Lube Oil Pump C is in MANUAL

Timer:	The "DFS-FURN-101 Lube Oil Pump Auto Switchover" timer (see above) becomes active when the following conditions are satisfied:
	• "DFS-FURN-101 Lube Oil Pump Auto Switchover" relay (see above) is active
	• Any of the following
	      • DFS-FURN-101 Lube Oil Pump B is PRIMARY and DFS-FURN-101 Lube Oil Pump C is running
	      • DFS-FURN-101 Lube Oil Pump C is PRIMARY and DFS-FURN-101 Lube Oil Pump B is running
	      • "DFS-FURN-101 Lube Oil Pump Auto Switchover" timer is timing

Device:	**MMS-GATE-103 ECR-A Blast Chute**
Advisor PC Tag:	X03HS131B
CONR:	C112
Driver Word:	0268
Driver Type:	9
Auto Open:	The auto open relay will be active if both of the following conditions are satisfied: • "Cycle ECR-A Charge Gates" relay (see below) is active • MMS-GATE-103 open timer is not expired

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFM**

Auto Close:	The auto close relay will be active if the following condition is satisfied: • MMS-GATE-103 auto open relay is not active
Open I-Lock:	All of the following conditions must be satisfied to allow the device to open: • 03-ZS-123B (MMS-GATE-101 closed) is made • 03-ZS-138B (PHS-GATE-101 closed) is made • 03-ZS-153B (PHS-GATE-103 closed) is made • RHS-RSM-101 Discharge Chute Fire is not made *(DICO from CONR101A at TE)* • 16-ZS-001B *at TE, 16-ZS-080B at AN* (DFS-GATE-101 closed) is made • Stop Waste Feed Deathwish (see A&I Matrix) is not active • *(TE only) DFS AWFCO permissive test bit from RSView is not active*
Close I-Lock:	None

Relay:	The "Cycle ECR-A Charge Gates" relay (see above) is latched when the following conditions are satisfied:
	• *(AN only)* Kiln home switch (window) timer timing
	• *(TE only) Seal-in bit until start feed initiate is not active*
	• Either of the following
	    • "ECR-A is selected as the primary feed source (asked first)" relay (see below) is active and "ECR-A is ready for gates to be cycled (asking)" relay (see below) is active
	    • "Manual gate cycle for ECR-A waste" driver is active
	
	The "Cycle ECR-A Charge Gates" relay (see above) is unlatched when the "Reset Request for ECR-A Gates Cycle" relay (see below) becomes active *(one-shot) or (TE only)"Stop Waste Feed" Deathwish is active (see A&I Matrix)*

Relay:	The "Reset Request for ECR-A Gates Cycle" relay (see above) becomes active when either of the following conditions are satisfied: • 16-ZS-001A *at TE, 16-ZS-080A at AN* (DFS-GATE-101 open) is made • DFS-GATE-101 open timer is expired and 03-ZS-131A (MMS-GATE-103 open) is not made
Relay:	The "ECR-A is selected as the primary feed source (asked first)" relay (see above) is latched when the following conditions are satisfied: • Any of the following • "Fuze Section of Rocket (or projectile burster) is on Upper Gate" (DICO from CONR101A) is active

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFM**

	• "Burster Section of Rocket is on Upper Gate" (DICO from CONR101A) is active
	• "Motor Section of Rocket is on Upper Gate" (DICO from CONR101A) is active
	• "Stop Waste Feed" Deathwish is not active (see A&I Matrix)
	• "RHS-RSM-101 Watch dog time out" (DICO from CONR101A) is not active
	• *(AN only)* "DFS Rockets/HR" *limit reached* is not active
	• *(TE only) "DFS Rockets/HR" I-lock limit reached is not active or projos selected (DICO from CONR101A.)*
	• *(TE only) "DFS Projos/HR" limit reached is not active*
	• "ECR-B is selected as the primary feed source (asked first)" relay is not active
	
	The "ECR-A is selected as the primary feed source (asked first)" relay (see above) is unlatched when any of the following conditions are satisfied:
	• "RHS-RSM-101 Watchdog time-out" (DICO from CONR101A) is active
	• Primary ECR timer has expired and "ECR-A is ready for gates to be cycled (asking)" relay (see below) is not active
	• All of the following
	    • Kiln home switch (window) timer not timing
	    • "Motor Section of Rocket is on Upper Gate" (DICO from CONR101A) is active
	    • "MMS-GATE-103 (ECR-A) open driver is active
	    • "ECR-A is ready for gates to be cycled (asking)" relay (see below) is not active

Relay:	The "ECR-A is ready for gates to be cycled (asking)" relay (see above) will be active when the following conditions are satisfied:
	• Any of the following
	    • "Fuze Section of Rocket (or projectile burster) is on Upper Gate" (DICO from CONR101A) is active
	    • "Burster Section of Rocket is on Upper Gate" (DICO from CONR101A) is active
	    • "Motor Section of Rocket is on Upper Gate" (DICO from CONR101A) is active
	• "Stop Waste Feed" Deathwish is not active (see A&I Matrix)
	• "RHS-RSM-101 Watch dog time out" (DICO from CONR101A) is not active
	• *(AN only)* "DFS Rockets/HR" *limit reached* is not active
	• *(TE only) "DFS Rockets/HR" I-lock limit reached is not active or projos selected (DICO from CONR101A.)*
	• *(TE only) "DFS Projos/HR" limit reached is not active*

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFM**

Device:	**MMS-GATE-104 ECR-B Blast Chute**
Advisor PC Tag:	X03HS231B
CONR:	C112
Driver Word:	0269
Driver Type:	9

Auto Open: The auto open relay will be active if both of the following conditions are satisfied:
- "Cycle ECR-B Charge Gates" relay (see below) is active
- MMS-GATE-104 open timer is not expired

Auto Close: The auto close relay will be active if the following condition is satisfied:
- MMS-GATE-104 auto open relay is not active

Open I-Lock: All of the following conditions must be satisfied to allow the device to open:
- 03-ZS-223B (MMS-GATE-102 closed) is made
- 03-ZS-238B (PHS-GATE-102 closed) is made
- 03-ZS-253B (PHS-GATE-104 closed) is made
- RHS-RSM-102 Discharge Chute Fire is not made (DICO from CONR104A)
- 16-ZS-002B *at TE, 16-ZS-081B at AN* (DFS-GATE-102 closed) is made
- Stop Waste Feed Deathwish (see A&I Matrix) is not active
- *(TE only) DFS AWFCO permissive test bit from RSView is not active*

Close I-Lock: None

Relay: The "Cycle ECR-B Charge Gates" relay (see above) is latched when the following conditions are satisfied:
- Kiln home switch (window) timer timing
- *(TE only) Seal-in bit until start feed initiate is not active*
- Either of the following
  - "ECR-B is selected as the primary feed source (asked first)" relay (see below) is active and "ECR-B is ready for gates to be cycled (asking)" relay (see below) is active
  - "Manual gate cycle for ECR-B waste" driver is active

The "Cycle ECR-B Charge Gates" relay (see above) is unlatched when the "Reset Request for ECR-B Gates Cycle" relay (see below) becomes active *(one-shot) or (TE only)"Stop Waste Feed" Deathwish is active (see A&I Matrix)*

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFM**	
Relay:	The "Reset Request for ECR-B Gates Cycle" relay (see above) becomes active when either of the following conditions are satisfied: • 16-ZS-002A *at TE, 16-ZS-081A at AN* (DFS-GATE-102 open) is made • DFS-GATE-102 open timer is expired and 03-ZS-231A (MMS-GATE-104 open) is not made

Relay:	The "ECR-B is selected as the primary feed source (asked first)" relay (see above) is latched when the following conditions are satisfied:
	• Any of the following
	      • "Fuze Section of Rocket (or projectile burster) is on Upper Gate" (DICO from CONR104A) is active
	      • "Burster Section of Rocket is on Upper Gate" (DICO from CONR104A) is active
	      • "Motor Section of Rocket is on Upper Gate" (DICO from CONR104A) is active
	• "Stop Waste Feed" Deathwish is not active (see A&I Matrix)
	• "RHS-RSM-102 Watch dog time out" (DICO from CONR104A) is not active
	• *(AN only)* "DFS Rockets/HR" *limit reached* is not active
	• *(TE only) "DFS Rockets/HR" I-lock limit reached is not active*
	• "ECR-A is selected as the primary feed source (asked first)" relay is not active
	
	The "ECR-B is selected as the primary feed source (asked first)" relay (see above) is unlatched when any of the following conditions are satisfied:
	• "RHS-RSM-102 Watchdog time-out" (DICO from CONR104A) is active
	• Primary ECR timer has expired and "ECR-B is ready for gates to be cycled (asking)" relay (see below) is not active
	• All of the following
	      • Kiln home switch (window) timer not timing
	      • "Motor Section of Rocket is on Upper Gate" (DICO from CONR104A) is active
	      • "MMS-GATE-104 (ECR-B) open driver is active
	      • "ECR-B is ready for gates to be cycled (asking)" relay (see below) is not active

Relay:	The "ECR-B is ready for gates to be cycled (asking)" relay (see above) will be active when the following conditions are satisfied:
	• Any of the following
	      • "Fuze Section of Rocket (or projectile burster) is on Upper Gate" (DICO from CONR104A) is active
	      • "Burster Section of Rocket is on Upper Gate" (DICO from CONR104A) is active
	      • "Motor Section of Rocket is on Upper Gate" (DICO from CONR104A) is active

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFM**

	• "Stop Waste Feed" Deathwish is not active (see A&I Matrix) • "RHS-RSM-102 Watch dog time out" (DICO from CONR104A) is not active • *(AN only)* "DFS Rockets/HR" *limit reached* is not active • *(TE only) "DFS Rockets/HR" I-lock limit reached is not active*
Device:	**DFS-BLDR-101 [DFS-BLDR-102] Building Door**
Advisor PC Tag:	X16HS814 [X16HS815]
CONR:	C112 [C112]
Driver Word:	0270 [0271]
Driver Type:	9 (Manual only)
Auto Open:	None
Auto Close:	None
Open I-Lock:	All of the following conditions must be satisfied to allow the device to open: • CON E-Stop not active • DFS-BLDR-101 [DFS-BLDR-102] Latches are unclamped
Close I-Lock:	All of the following conditions must be satisfied to allow the device to close: • CON E-Stop not active • DFS-BLDR-101 [DFS-BLDR-102] Latches are unclamped
Device:	**DFS-FURN-101 Kiln Drive Oscillate Icon**
Advisor PC Tag:	X16HS038A
CONR:	C112
Driver Word:	0272
Driver Type:	1
	If the Oscillate icon is in manual, the CON operator can toggle whether or not the kiln drive is operating in the oscillate mode.
Auto Start:	The auto start relay will be active if the either of the following condition is satisfied: • The DFS Start Waste Feed Icon driver is not active and the Kiln Drive Oscillate auto start relay (seal-in) is active. • Oscillate Kiln Deathwish (see A&I Matrix) is active
Start I-Lock:	None
Device:	**DFS-BLDR-101 [DFS-BLDR-102] Building Door Latches**
Advisor PC Tag:	X16HV113 [X16HV115]
CONR:	C112 [C112]
Driver Word:	0273 [0274]
Driver Type:	9 (Manual only)
Auto Clamp:	None

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFM**

Auto Unclamp:	None
Clamp I-Lock:	All of the following conditions must be satisfied to allow the device to clamp: • CON E-Stop not active • DFS-BLDR-101 [DFS-BLDR-102] Door closed
Unclamp I-Lock:	The following condition must be satisfied to allow the device to unclamp: • CON E-Stop not active

Device:	**DFS-FURN-101 Start Waste Feed Icon**
Advisor PC Tag:	DFSFEED
CONR:	C112
Driver Word:	0275
Driver Type:	4 (Manual only) The CON operator selects this icon to request waste feed from the ECRs.
Auto Start:	None
Start I-Lock:	The following conditions must be satisfied to allow the device to request waste feed: • "Stop Waste Feed" Deathwish is not active (see A&I Matrix) • *(TE only)* 24-ZS-752B (Bleed Air Valve closed) is made • *(TE only) 16-ZS-863B (DFS-FURN-102 restart bypass valve closed) is made* • *(AN only) 16-ASL-175B (DFS-FURN-102 O2 alarm low) is not active* • *(AN only) PM cleanup waste to PDAR not active*

Device:	**DFS-FURN-101 Thrust Bearing Fan**
Advisor PC Tag:	X16FNTBF
CONR:	C112
Driver Word:	0276
Driver Type:	1
Auto Start:	The auto start relay will be active if either of the following conditions are satisfied: • DFS-FURN-102 Temperature Kiln Light Permissive (set when 16-TIT-197 rises above 1500 °F, reset when 16-TIT-197 lowers below 1000 °F) • DFS-FURN-101 Thrust Bearing Fan is running
Start I-Lock:	The following condition must be satisfied to allow the device to operate: • CON E-Stop is not active

Table D.2. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFM**

Device:	**DFS-FURN-101 Waste Bin Change-out Icon**
Advisor PC Tag:	DSCHGATES
CONR:	C112
Driver Word:	0277
Driver Type:	1 (Manual only)
	The CON operator selects this icon to set up for a waste bin change-out
Auto Start:	None
Start I-Lock:	None

Device:	**DFS-CHUT-101 [DFS-CHUT-102] Manual Gate Cycle Icon**
Advisor PC Tag:	CHUT101 [CHUT102]
CONR:	C112 [C112]
Driver Word:	0278 [0279]
Driver Type:	1 (Manual only)
	The CON operator selects this icon to initiate a one-time gate cycle feed sequence for DFS-CHUT-101 [DFS-CHUT-102]
Auto Start:	None
Start I-Lock:	The following conditions must be satisfied to allow the device to request waste feed:

- "Stop Waste Feed" Deathwish is not active (see A&I Matrix)
- Either of the following
    - "Line A [Line B] agent weight from rocket will exceed allowable limit" relay is not active
    - "Fuze Section of Rocket is on Upper Gate" (DICO from CONR101A [CONR104A]) is active
- *(TE only)* "DFS Rockets/HR" pre-alarm is not active
- *(TE only)* "Waste is above hourly limit" relay is not active

Table D.3. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFT**

Device:	**DFS-CNVX-101A Upper Heaters**
Advisor PC Tag:	X16HS176A
CONR:	C112
Driver Word:	0461
Driver Type:	1

Auto Start: The auto start relay will be active if the following condition is satisfied:
- "Free Running 2-minute Timer for Time-Proportional Control"has not exceeded the "DFS-FURN-101 HDC Upper Heater Bank Time On" (see below) parameter

Start I-Lock: The following conditions must be satisfied to allow the device to operate:
- "Shut Down HDC Heaters" Deathwish is not active (see A&I Matrix)

(Note: A hardwired interlock requires the HDC conveyor to be running in order to energize the heaters when 16-TIT-184 < 800°F)

Parameter: "DFS-FURN-101 HDC Upper Heater Bank Time On" (see above) parameter is set to the control variable (CV) output of 16-TIC-184 (0 to 100) times 1.2. This will result in a value of between 0 and 120 seconds. For instance, if the 16-TIC-184 CV is 50%, then the "time on" value is 60. This means that the heaters will be on for the first 60 seconds (50%) of the next cycle of the "Free Running 2-minute Timer for Time-Proportional Control"

Device:	**DFS-CNVX-101B Lower Heaters**
Advisor PC Tag:	X16HS176B
CONR:	C112
Driver Word:	0462
Driver Type:	1

Auto Start: The auto start relay will be active if the following condition is satisfied:
- "Free Running 2-minute Timer for Time-Proportional Control" has not exceeded the "DFS-FURN-101 HDC Lower Heater Bank Time On" (see below) parameter

Start I-Lock: The following conditions must be satisfied to allow the device to operate:
- "Shut Down HDC Heaters" Deathwish is not active (see A&I Matrix)

(Note: A hardwired interlock requires the HDC conveyor to be running in order to energize the heaters when 16-TIT-042 < 790°F)

Parameter: "DFS-FURN-101 HDC Lower Heater Bank Time On" (see above) parameter is set to the control variable (CV) output of 16-TIC-042 (0 to 100) times 1.2. This will result in a value of between 0 and 120 seconds. For instance, if the 16-TIC-042 CV is 50%, then the "time on" value is

Table D.3. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFT**

	60. This means that the heaters will be on for the first 60 seconds (50%) of the next cycle of the "Free Running 2-minute Timer for Time-Proportional Control"

Device:	**DFS-CHUT-101 [DFS-CHUT-102] Water/Decon Block Valve**
Advisor PC Tag:	*(AN) X16XV235 [X16XV236]*
	(TE) X16XV236 [X16XV235]
CONR:	C112 [C112]
Driver Word:	0464 [0465]
Driver Type:	3
Auto Open:	The auto open relay will be active if the following condition is satisfied:
	• 16-TIC-008 (DFS-FURN-101 exhaust gas to DFS-FURN-102 after quench temperature) is ≥ 500 °F.
Open I-Lock:	None

Device:	**DFS-FURN-101 Water/Decon 3-Way Valve**
Advisor PC Tag:	X16XV075
CONR:	C112
Driver Word:	0466
Driver Type:	4 (Manual only)
	The operator selects this icon and issues a manual OPEN command to align the 3-way valve to decon or a manual CLOSE command to align the 3-way valve to water.
Auto Open:	None
Open I-Lock:	None

Device:	**DFS Chute Camera Display**
Advisor PC Tag:	BORE_SET
CONR:	C112
Driver Word:	0467
Driver Type:	4
	The operator selects this icon and issues a manual OPEN command to display the chute camera to DFS-CHUT-101 or a manual CLOSE command to display the chute camera to DFS-CHUT-102.
Auto:	The PLC will alternate the camera display every 30 seconds
I-Lock:	None

Table D.4. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DFA**

Device:	**DFS-FURN-101 Water to Kiln Exhaust Quench Block Valve**
Advisor PC Tag:	X16XV213
CONR:	C112
Driver Word:	1060
Driver Type:	3
Auto Open:	The auto open relay will be active if the following condition is satisfied:
	• 16-TIC-020 (DFS-FURN-101 burner end temperature) is ≥ 1000 °F.
Open I-Lock:	None

Device:	**DFS-FURN-101 Air to Kiln Exhaust Quench Block Valve**
Advisor PC Tag:	X16XV280
CONR:	C112
Driver Word:	1061
Driver Type:	3
Auto Open:	The auto open relay will be active if the following condition is satisfied:
	• 16-TIC-020 (DFS-FURN-101 burner end temperature) is ≥ 500 °F.
Open I-Lock:	None

Device:	**16-AIT-059 CO Analyzer Calibration Icon** **(Not required at ANCDF, PBCDF, and UMCDF)**
Advisor PC Tag:	X16HS059
CONR:	C112
Driver Word:	1062
Driver Type:	N/A - Not a standard driver
	The operator selects this icon and issues a manual OPEN command to place the analyzer to 'HIGH RANGE' or a manual CLOSE command to return it to "LO RANGE"

Table D.5. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFK**

Device: **DFS-BLOW-101 Kiln Combustion Air Blower**
Advisor PC Tag: X16BW101
CONR: C112
Driver Word: 2060
Driver Type: 1

Auto Start: The auto start relay will be active if either of the following conditions are
                       satisfied:
                       •   "DFS PAS is Normal" relay (see below) is active (Note: Follow-
                                on sites will require "PAS/PFS Normal"; see PAS/PFS FAWB,
                                Programmatic Process FAWB Book 28) *and (TE only) kiln
                                purge permissive relay is active*
                       •   Kiln Combustion Air Blower auto start relay (seal-in) is active
                                and "Shut Down Kiln Blower" Deathwish is not active (see A&I
                                Matrix)
Start I-Lock: The following condition must be satisfied to allow the device to operate:
                       •   "Shut Down Kiln Blower" Deathwish is not active (see A&I
                                Matrix)

Relay: The "DFS PAS is Normal" relay (see above) is active when all of the
                       following conditions are satisfied:
                       •   Either Clean Liquor Pump (PAS-PMP-108/109 *at TE, PFS-
                                PMP-138/139 at AN*) is running
                       •   Either Quench Brine Pump (PAS-PMP-106/107) is running
                       •   PAS Scrubber Sump 102 level is not *high* (24-LSHH-032 *at TE,
                                24-LSHHH-032 at AN* not active or 24-LAH-010 not active)
                       •   PAS Scrubber Sump 102 level is not *low* (24-LSLL-024 *at TE,
                                24-LSLLL-024 at AN* not active or 24-LAL-010 not active)
                       •   PAS Quench Tower 103 level is not HI HI (24-LAHH-009 not
                                active)
                       •   PAS Quench Tower 103 Exhaust Temperature is not HI HI HI
                                (24-TSHHH-375 not active)
                       •   PAS Demister 104 level is not HI HI (24-LSHH-313 not active)
                       •   Either Stage of ID Fan (PAS-BLOW-103A/103B) is running
                       •   *(AN only) 16-PIC-018 set Auto mode relay is active (no code yet
                                to set the relay)*
                       •   *(TE only) Either of the following:*
                                •   *16-PIC-018 set Auto mode relay is active, which is set
                                         by 16-XV-862 DFS-FURN-101 isolation valve open with
                                         16-PIC-018 selected for PV-018 control and either of
                                         the following:*
                                         •   *Either stage of ID Fan (PAS-BLOW-103A/103B)
                                                  is running and 24-XV-073 (PAS-BLOW-103
                                                  outlet damper) is open (on time delay)*
                                         •   *24-XV-073 (PAS-BLOW-103 outlet damper) is
                                                  not closed and 16-PIC-018 is set in Auto mode*

Table D.5. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DFK**

	• *16-PIC-065 set Auto mode relay is active,16-XV-862 DFS-FURN-101 isolation valve closed with 16-PIC-065 selected for PV-018 control and either of the following:*
	• *Either stage of ID Fan (PAS-BLOW-103A/103B) is running and 24-XV-073 (PAS-BLOW-103 outlet damper) is open (on time delay)*
	• *24-XV-073 (PAS-BLOW-103 outlet damper) is not closed and 16-PIC-065 is set in Auto mode*

Device:	**DFS-BURN-101 Kiln Burner**
Advisor PC Tag:	X16HS842
CONR:	C112
Driver Word:	2061
Driver Type:	4 (manual only)
Auto start:	N/A. The burner is manual operation only.
Start I-Lock:	The following condition must be satisfied to allow the device to operate:
	• "Shut Down Kiln Burner" Deathwish is not active (see A&I Matrix)

Device:	**DFS-BURN-101 Kiln Burner BMS Lockout Reset Icon**
Advisor PC Tag:	X16HS843
CONR:	C112
Driver Word:	2062
Driver Type:	N/A
Auto start:	N/A
I-Lock:	N/A
	When the operator selects this icon and issues a manual start command, the PLC will energize the "Lockout Reset" output for a preset time duration.

Table D.6. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DF1/DF2**

Device:	**DFS-BLOW-102 Afterburner Combustion Air Blower**
Advisor PC Screen:	DF1
Advisor PC Tag:	X16BW102
CONR:	C112
Driver Word:	2260
Driver Type:	1
Auto Start:	*(TE only)* The auto start relay will be active if the following conditions are satisfied:

- "Shut Down Afterburner Blower" Deathwish is not active (see A&I Matrix) and *either* of the following:
  - Afterburner Combustion Air Blower auto start relay (seal-in) is active
  - *16-FIT-078 afterburner #1 combustion air < 11% CV and 16-FIT-079 afterburner #2 combustion air < 11% CV and either of the following*
    - *"DFS PAS is Normal" relay (see below) is active and kiln purge permissive relay is active*
    - *PAS-BLOW-107 (DFS emergency exhaust blower) is running*

Auto Start:	*(AN only) The auto start relay will be active if either of the following conditions are satisfied:*

- *"Shut Down Afterburner Blower" Deathwish is not active (see A&I Matrix) and either of the following:*
  - *"DFS PAS is Normal" relay (see below) is active (Note: Follow-on sites will require "PAS/PFS Normal"; see PAS/PFS FAWB, Programmatic Process FAWB Book 28)*
  - *Afterburner Combustion Air Blower auto start relay (seal-in) is active*
- *Power Restart Sequencing timer (recovery from loss of utility power, start essential loads) is in the 10 to 20 second window and the Afterburner Combustion Air Blower had been running prior to the power loss*

Start I-Lock:	The following condition must be satisfied to allow the device to operate:

- "Shut Down Afterburner Blower" Deathwish is not active (see A&I Matrix) and any of the following:
  - "DFS PAS is Normal" relay (see below) is active (Note: Follow-on sites will require "PAS/PFS Normal"; see PAS/PFS FAWB, Programmatic Process FAWB Book 28)
  - Loss of Utility Power (DICO form CONR109) is active
  - Afterburner Combustion Air Blower is running
  - *(TE only)* PAS-BLOW-107 (DFS emergency exhaust blower) is running

Table D.6. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences
Advisor PC Screen: **DF1/DF2**

Relay:

The "DFS PAS is Normal" relay (see above) is active when all of the following conditions are satisfied:

- Either Clean Liquor Pump (PAS-PMP-108/109 *at TE, PFS-PMP-138/139 at AN*) is running
- Either Quench Brine Pump (PAS-PMP-106/107) is running
- PAS Scrubber Sump 102 level is not *high* (24-LSHH-032 *at TE, 24-LSHHH-032 at AN* not active or 24-LAH-010 not active)
- PAS Scrubber Sump 102 level is not *low* (24-LSLL-024 *at TE, 24-LSHHH-024 at AN* not active or 24-LAL-010 not active)
- PAS Quench Tower 103 level is not HI HI (24-LAHH-009 not active)
- PAS Quench Tower 103 Exhaust Temperature is not HI HI HI (24-TSHHH-375 not active)
- PAS Demister 104 level is not HI HI (24-LSHH-313 not active)
- Either Stage of ID Fan (PAS-BLOW-103A/103B) is running
- *(AN only) 16-PIC-018 set Auto mode relay is active (no code yet to set the relay)*
- *(TE only) Either of the following:*
  - *16-PIC-018 set Auto mode relay is active, which is set by 16-XV-862 DFS-FURN-101 isolation valve open with 16-PIC-018 selected for PV-018 control and either of the following:*
    - *Either stage of ID Fan (PAS-BLOW-103A/103B) is running and 24-XV-073 (PAS-BLOW-103 outlet damper) is open (on time delay)*
    - *24-XV-073 (PAS-BLOW-103 outlet damper) is not closed and 16-PIC-018 is set in Auto mode*
  - *16-PIC-065 set Auto mode relay is active,16-XV-862 DFS-FURN-101 isolation valve closed with 16-PIC-065 selected for PV-018 control and either of the following:*
    - *Either stage of ID Fan (PAS-BLOW-103A/103B) is running and 24-XV-073 (PAS-BLOW-103 outlet damper) is open (on time delay)*
    - *24-XV-073 (PAS-BLOW-103 outlet damper) is not closed and 16-PIC-065 is set in Auto mode*

Device:	**DFS-BURN-102 Afterburner #1 [Afterburner #2]**
Advisor PC Screen:	DF1 [DF2]
Advisor PC Tag:	X16HS846 [X16HS847]
CONR:	C112 [C112]
Driver Word:	2261 [2461]
Driver Type:	4 (manual only)
Auto start:	N/A. The burner is manual operation only.
Start I-Lock:	The following condition must be satisfied to allow the device to operate:

- "Shut Down Afterburner #1 [Afterburner #2]" Deathwish is not active (see A&I Matrix)

Table D.6. *ANCDF and* TOCDF DFS PLC Automatic Control Sequences Advisor PC Screen: **DF1/DF2**
Device: **DFS-BURN-102 Afterburner #1 [Afterburner #2] BMS Lockout Reset Icon**

Device: **DFS-BURN-102 Afterburner #1 [Afterburner #2] BMS Lockout Reset Icon**

Advisor PC Screen: DF1 [DF2]

Advisor PC Tag: X16HS848 [X16HS849]

CONR: C112 [C112]

Driver Word: 2262 [2462]

Driver Type: N/A

Auto start: N/A

I-Lock: N/A

When the operator selects this icon and issues a manual start command, the PLC will energize the "Lockout Reset" output for a preset time duration.

D.2   DFS Burner Management System Control Logic

There are five important control circuits associated with the FIREYE control schemes for the DFS furnaces. They are defined as:

L1-13   Burner start circuit. It is usually energized via a discrete output from the PLC-3. It is a result of the operator starting a burner from a control screen.

13-3   Fuel Valve End Switch (FVES) circuit. This circuit will be energized when all of the associated fuel gas block valves are closed. This circuit is required only until the "Pilot Trial For Ignition" step.

3-P   Running Interlock circuit. This circuit will contain the logic contacts associated with an operating burner. It will include items such as gas supply pressure HI HI, gas supply pressure LO LO, Extreme Thermal Limit (ETL), combustion air blower pressure LO LO, etc.   If the 3-P circuit is lost at any time during the operation of the burner, the burner will LOCKOUT.

M-D   LO-FIRE circuit. This circuit will energize when the associated fuel gas control valve is at LO-FIRE. This circuit is required for lighting the burner.

D-8   HI-PURGE circuit. This circuit will energize when the purge timer expires. This circuit is required for lighting the burner.

The control logic presented in Table D.7 is based on TOCDF drawings 42-408-646 (EG&G Rev.*18*), 42-408-648 (EG&G Rev.*16*) and 42-408-669 (EG&G Rev.*12*).

Table D.7.   TOCDF DFS BMS Circuit Logic

Table D.7.   TOCDF DFS BMS Circuit Logic
System Purge
The system purge timer (TR 1-1) will initiate if all of the following conditions are satisfied: • *FA-9430 DFS PAS low-low air flow (see FAWB Note B-25)*   • PAS-BLOW-103A running, PAS-BLOW-103B running or PAS-BLOW-107 running   • 24-FSL-430 DFS System minimum draft to purge   • ZS-79A Afterburner #2 combustion air flow control valve at high fire   • ZS-312B Afterburner #1 fuel gas block valve XV-312 closed   • ZS-313B Afterburner #2 fuel gas block valve XV-313 closed   • ZS-311B Afterburner #2 fuel gas block valve XV-311 closed   • ZS-78A Afterburner #1 combustion air flow control valve at high fire   • PSLL-301 Afterburner #1 combustion air blower pressure low low

Table D.7.   TOCDF DFS BMS Circuit Logic

• PSLL-302 Afterburner #2 combustion air blower pressure low low
    • ZS-310B Afterburner #1 fuel gas block valve XV-310 closed
    • "Kiln Purge Permissive" relay (see below) is active *or ZS-862B DFS kiln isolation valve XV-862 closed.*
 	
Relay: The "Kiln Purge Permissive" relay (see above) will be active when the following conditions are satisfied:
    • ZS-21A Kiln combustion air flow control valve at high fire
    • PSLL-29 Kiln combustion air blower pressure low low
    • ZS-356B Kiln fuel gas block valve XV-356 closed
    • ZS-359B Kiln fuel gas block valve XV-359 closed
    • ZS-16A Kiln shroud air damper HV-16 open
    • ZS-17A Kiln shroud air damper HV-17 open
 	
Once initiated, the system purge timer will time out after eight minutes[1]. Once timed out, *either of* the following conditions must be satisfied to maintain SYSTEM PURGE:
    • *TSL-197 Afterburner gas temperature $\geq 1400\ °F$*
    • *FA-9430 DFS PAS low-low air flow (see FAWB Note B-25) and either* of the following:
        • Afterburner #1 BMS Lockout not active
        • Afterburner #2 BMS Lockout not active

Kiln Purge
 	
The kiln purge timer (TR 3-1) will initiate if all of the following conditions are satisfied:
    • *FA-9430 DFS PAS low-low air flow (see FAWB Note B-25)*
    • System Purge Complete (TR 1-1 timer expired)
    • "Kiln Purge Permissive" relay (see below) is active
 	
Relay: The "Kiln Purge Permissive" relay (see above) will be active when the following conditions are satisfied:
    • ZS-21A Kiln combustion air flow control valve at high fire
    • PSLL-29 Kiln combustion air blower pressure low low
    • ZS-356B Kiln fuel gas block valve XV-356 closed
    • ZS-359B Kiln fuel gas block valve XV-359 closed
    • ZS-16A Kiln shroud air damper HV-16 open
    • ZS-17A Kiln shroud air damper HV-17 open
 	
Once initiated, the kiln purge timer will time out after 2.5 minutes[1]. Once initiated, the following conditions must be satisfied to maintain KILN PURGE:
    • *FA-9430 DFS PAS low-low air flow (see FAWB Note B-25)*
    • System Purge Complete (TR 1-1 timer expired)
    • Either of the following:
        • Kiln burner BMS Lockout not active
        • TSL-62 Kiln gas temperature $\geq 1400\ °F$

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[1] To ensure that NFPA purge requirements are met, the timer values may be increased for sites with a PFS due to the volume added to the system by the DFS PFS.

Table D.7.   TOCDF DFS BMS Circuit Logic

DFS Afterburner #1

L1-13   The L1-13 circuit will be made when the PLC issues a burner start.

13-3   The 13-3 circuit will be made if all of the following conditions are satisfied:
- ZS-312B Afterburner #1 fuel gas block valve XV-312 closed
- ZS-310B Afterburner #1 fuel gas block valve XV-310 closed

3-P   The 3-P circuit will be made if all of the following conditions are satisfied:
- PSHH-195 Afterburner #1 fuel gas pressure switch high high
- PSLL-194 Afterburner #1 fuel gas pressure switch low low
- TISHH-197 Afterburner chamber gas temperature high high
- DFS-BLOW-102 Afterburner combustion air blower running
- PAS-BLOW-103A running, PAS-BLOW-103B running or PAS-BLOW-107 running
- PSLL-301 Afterburner #1 combustion air blower pressure low low
- *FA-9430 DFS PAS low-low air flow (see FAWB Note B-25)*

M-D   The M-D circuit will be made if all of the following conditions are satisfied:
- ZS-78B Afterburner #1 combustion air flow control valve at low fire
- ZS-191 Afterburner #1 fuel gas flow control valve at low fire

D-8   The D-8 circuit will be made if the system purge timer (TR 1-1) has timed out (see above).

DFS Afterburner #2

L1-13   The L1-13 circuit will be made when the PLC issues a burner start.

13-3   The 13-3 circuit will be made if all of the following conditions are satisfied:
- ZS-313B Afterburner #2 fuel gas block valve XV-313 closed
- ZS-311B Afterburner #2 fuel gas block valve XV-311 closed

3-P   The 3-P circuit will be made if all of the following conditions are satisfied (This logic differs from AFB#1. The 3-P running interlock listed for AFB#1 is the desired configuration):
- PSHH-69 Afterburner #2 fuel gas pressure switch high high
- PSLL-68 Afterburner #2 fuel gas pressure switch low low
- TISHH-197 Afterburner chamber gas temperature high high
- DFS-BLOW-102 Afterburner combustion air blower running
- PAS-BLOW-103A running, PAS-BLOW-103B running or PAS-BLOW-107 running
- PSLL-302 Afterburner #2 combustion air blower pressure low low
- *FA-9430 DFS PAS low-low air flow (see FAWB Note B-25)*

Table D.7.   TOCDF DFS BMS Circuit Logic
M-D	The M-D circuit will be made if all of the following conditions are satisfied: • ZS-79B Afterburner #2 combustion air flow control valve at low fire • ZS-66 Afterburner #2 fuel gas flow control valve at low fire
D-8	The D-8 circuit will be made if the system purge timer (TR 1-1) has timed out (see above).

DFS Kiln Burner

L1-13   The L1-13 circuit will be made when the PLC issues a burner start.

13-3   The 13-3 circuit will be made if all of the following conditions are satisfied:
- ZS-356B Kiln fuel gas block valve XV-356 closed
- ZS-359B Kiln fuel gas block valve XV-359 closed

3-P   The 3-P circuit will be made if all of the following conditions are satisfied:
- PSHH-25 Kiln burner fuel gas pressure switch high high
- PSLL-23 Kiln burner fuel gas pressure switch low low (on time delay)
- TISHH-62 Kiln gas temperature high high
- DFS-BLOW-101 Kiln combustion air blower running
- PAS-BLOW-103A running, PAS-BLOW-103B running or PAS-BLOW-107 running
- PSLL-29 Kiln combustion air blower pressure low low
- *FA-9430 DFS PAS low-low air flow (see FAWB Note B-25)*

M-D   The M-D circuit will be made if all of the following conditions are satisfied:
- ZS-21B Kiln combustion air flow control valve at low fire
- ZS-243 Kiln fuel gas flow control valve at low fire

D-8   The D-8 circuit will be made if the kiln purge timer (TR 3-1) has initiated (see above).

APPENDIX E

Operator Screens

Appendix E contains the *ANCDF and* TOCDF Advisor PC screens associated with operation and control of the DFS system based on the *April 2001 ANCDF control code and the April 2001* TOCDF control code. As Advisor PC screens are generated for PBCDF and UMCDF, they will be included in this appendix. Table E.1 provides an index to the screens[1].

Table E.1   DFS Advisor PC Screens

Figure #	Advisor PC Screen Name	Process Screen
E-1	*ANCDF DFS Kiln Burner*	*DFK*
E-2	*ANCDF DFS Furnace Temperature*	*DFT*
E-3	*ANCDF DFS Afterburner*	*DFA*
E-4	*ANCDF DFS Afterburner #1*	*DF1*
E-5	*ANCDF DFS Afterburner #2*	*DF2*
E-6	*ANCDF DFS Material Handling*	*DFM*
E-7	*TOCDF* DFS Kiln Burner	DFK
E-8	*TOCDF* DFS Furnace Temperature	DFT
E-9	*TOCDF* DFS Afterburner	DFA
E-10	*TOCDF* DFS Afterburner #1	DF1
E-11	*TOCDF* DFS Afterburner #2	DF2
E-12	*TOCDF* DFS Material Handling	DFM
E-13	*TOCDF DFS Stop Feed Status, Page 1*	*DFSF1*
E-14	*TOCDF DFS Stop Feed Status, Page 2*	*DFSF2*
E-15	*TOCDF DFS RCRA Alarm Summary*	*RCE*
E-16	*TOCDF DFS Overview*	*DFO*

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[1] *The ANCDF DFS stop feed screens and DFS RCRA alarm summary screen will be included in a future revision to the FAWB.*

Figure E-1. ANCDF Advisor PC Screen DFS Kiln Burner (DFK)

Figure E-2. ANCDF Advisor PC Screen DFS Furnace Temperature (DFT)

DFS AFTERBURNER (DFA)

```
CAL  AIT-09                                    I-LOCK  DI   DO
ASL-09                              XV-862      DFM  DF2  DF1
XS-09   XXXX %O2                               DFT  DFK  DFQ
     ATOMIZING AIR                          PSLL-863
                                            XV-863  AIR      PDAH-813
XV-280                   PAH-065            I/O INLET  PD-813
     PSL-096             PAL-065
     TAHH-008            PIT-65             PSL-863A    XXXXX DPI
     TAH-008                                PSL-863B
     TAL-008             XXXXX "WC          PSL-863C    FAH-813
XV-213  TIC-08  TV-08  PSH-148                TI-813    FI-813
                                            TAHH-092
     XXXXX °F   XXX %                       TAH-092    XXXXX °F  XXXXX CFS
                                            TAL-092
     XXXXX °F                               TALL-092
                                            TIC-92            TO PAS
                                            XXXXX °F  M
                        EXH FROM DFS KILN, SEE
                        SCREENS "DFT" & "DFM"   XXXXX °F    XXXXX PSIA  XXXXX SEC
                                            CV=XXX%          PI-813    KI-813
                        PIT-168                                        KAL-813
PG UP/DN                DUCT PRESS          TSHH-197
SCREEN                                      TSH-197     AI-781E        AIT-781
PGUP PGDN               XXXXX "WC           TSL-197
                                            TI-197    XXXXXX %    XXX %CO2
                                            XXXXX °F  COMB EFF.  CAL  XS-781
                        TI-182                        AAL-781E   BOTH IN CAL
             TAHH-182   DUCT TEMP           EXPLOSION 5 MIN AVG.       AIT-781B
             TAH-182                        XS-859
             TALL-182   XXXXX °F            ASL-064   AAL-781I    XXX %CO2
                                            EMERGENCY STOP  INSTANTANEOUS  CAL  XS-781E
```

Figure E-3.   ANCDF Advisor PC Screen DFS Afterburner (DFA)

DFS AFTERBURNER #1 (DF1)

```
SYSTEM                                                    DFT  DFA  DF2
PURGING                                                   DFK  DFM  DFQ
SYSTEM                                                    I-LOCK  DI  DO
PURGE
COMPLETE
                PI-106      TI-822       FIC-078       FV-078    AFTER
COMB AIR                               FLOW CONT                BURNER
BLOW-102       XXXXX "WC   XXXXX °F                              #1
                                        XXXXX SCFM    XXX %
                PAL-106                  XXXXX SCFM              I   M
                PSLL-301                          HI FIRE
             I                          PILOT AIR  LO FIRE    MANUAL
             @                                                OPER.
                        PI-229       #2                       ONLY.
             L          PCV  XXXXX PSI  PILOT         XY-88   FIRING
             XXX %                                            RATE
FY-024                 PAH-229                PSHH-852         XXX %
                                                            LOCKOUT
                PI-201                                       F9 TO
                                     FIC-191       FV-191    RESET
FUEL GAS       XXXXX PSI  XY-312  XY-310  FLOW CONT          EXCESS AIR
                                        XXXXX SCFM   XXX %
                PAH-201                  XXXXX SCFM            XXX %
                PAL-201                          LO FIRE  PSHH-195
XS-859             PSLL-194                                  FFAH-078
BMS MESSAGE:                                                 FFAL-078
```

Figure E-4.   ANCDF Advisor PC Screen DFS Afterburner #1 (DF1)

Figure E-5.   ANCDF Advisor PC Screen DFS Afterburner #2 (DF2)

Figure E-6.   ANCDF Advisor PC Screen DFS Material Handling (DFM)

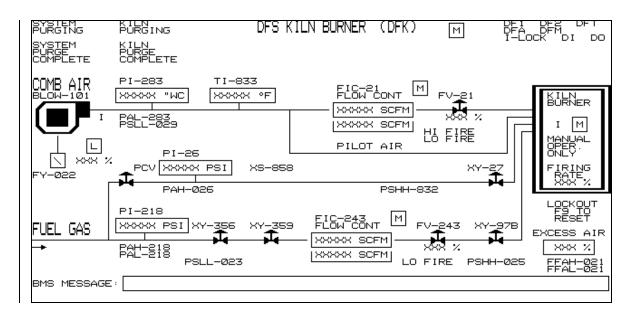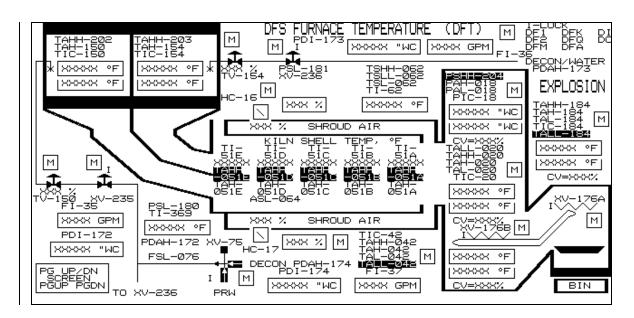Figure *E-7*.   TOCDF Advisor PC Screen DFS Kiln Burner (DFK)

Figure *E-8*.   TOCDF Advisor PC Screen DFS Furnace Temperature (DFT)
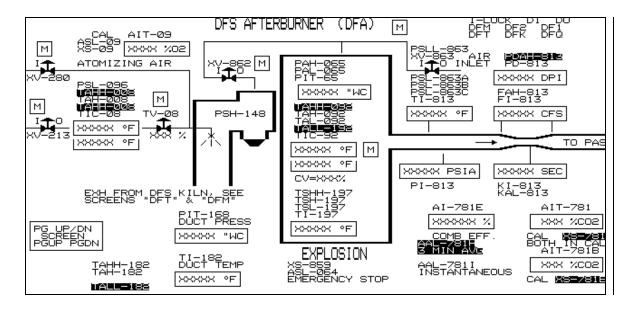
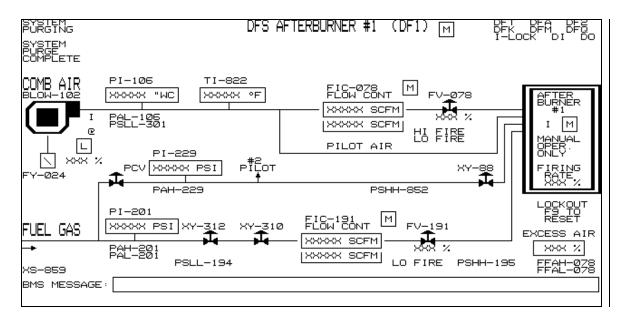Figure *E-9*.   TOCDF Advisor PC Screen DFS Afterburner (DFA)

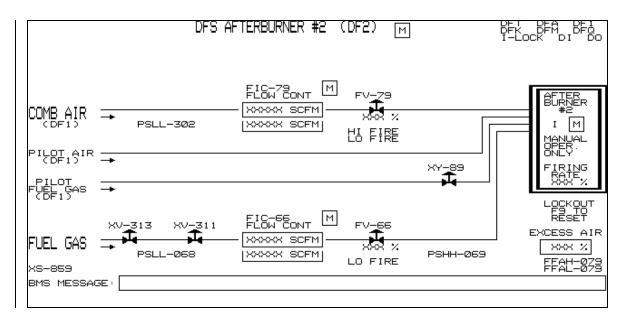Figure *E-10*.   TOCDF Advisor PC Screen DFS Afterburner #1 (DF1)

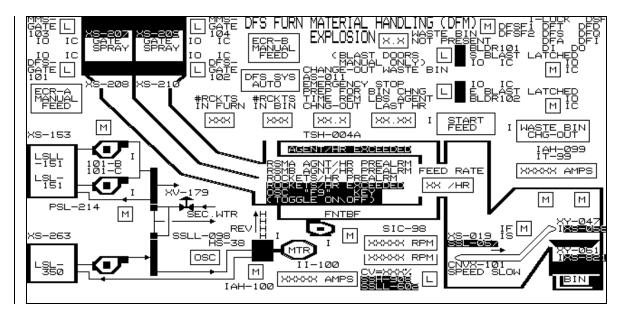Figure *E-11*.   TOCDF Advisor PC Screen DFS Afterburner #2 (DF2)

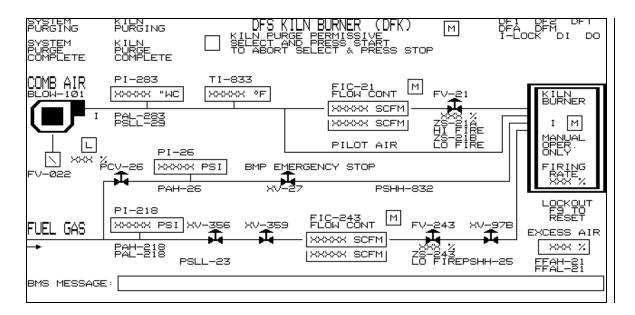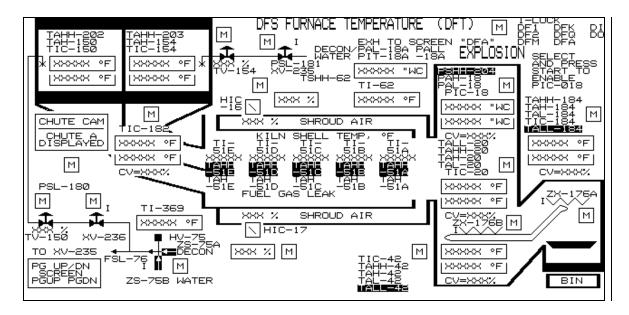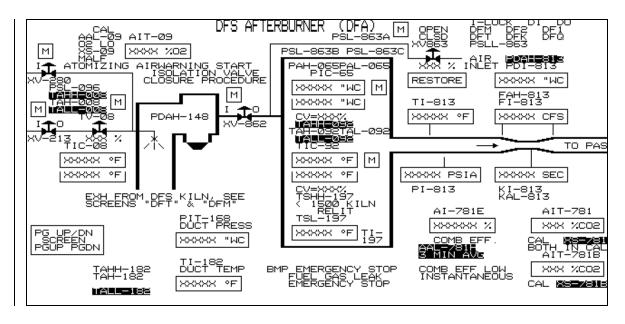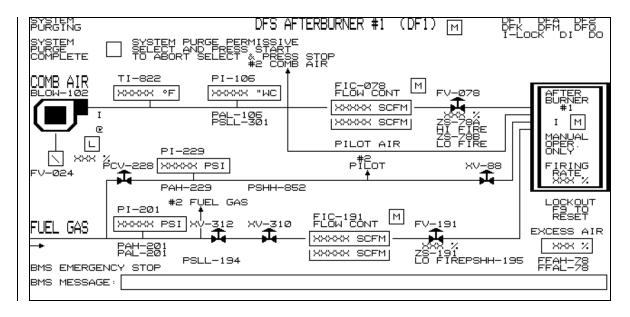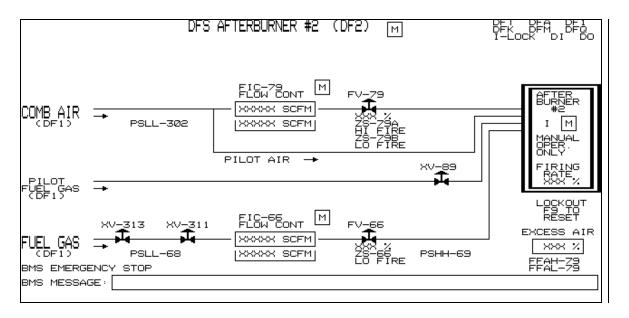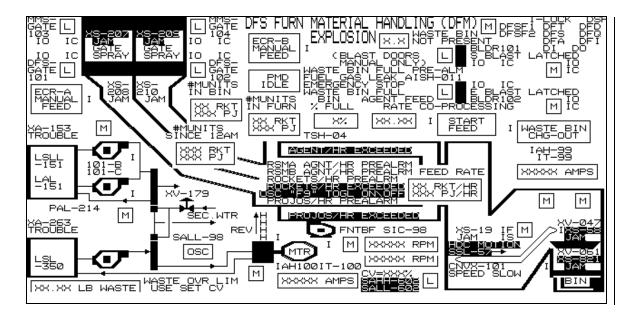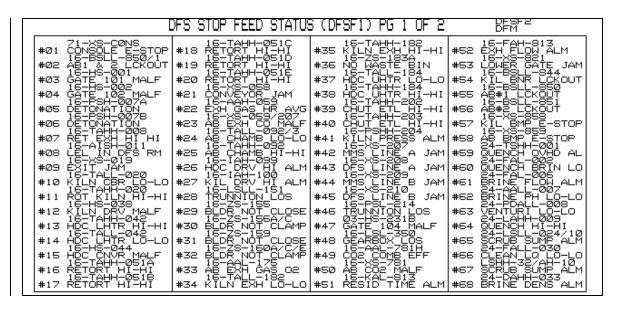Figure *E-12*.   TOCDF Advisor PC Screen DFS Material Handling (DFM)

```
            DFS STOP FEED STATUS (DFSF1) PG 1 OF 2          DFSF2
                                                            DFM
        71-XS-CONS              16-TAHH-051C          16-TAHH-182          16-FAH-813
 #01  CONSOLE E-STOP     #18  RETORT HI-HI      #35  KILN EXH HI-HI   #52  EXH FLOW ALM
        16-BSLL-850/1          16-TAHH-051D          16-ZS-183A            16-XS-821
 #02  AB1 & 2 LCKOUT     #19  RETORT HI-HI      #36  NO WASTE BIN     #53  LOWER GATE JAM
        16-HS-001              16-TAHH-051E          16-TALL-184           16-BSLL-844
 #03  GATE 101 MALF      #20  RETORT HI-HI      #37  HDC UHTR LO-LO   #54  KIL BNR LCKOUT
        16-HS-002              16-XS-058             16-TAHH-184           16-BSLL-850
 #04  GATE 102 MALF      #21  CONVEYOR JAM      #38  HDC UHTR HI-HI   #55  AB#1 LCKOUT
        16-PSH-007A            16-AAH-059            16-TAHH-202           16-BSLL-851
 #05  DETONATION         #22  EXH GAS HR AVG    #39  CHUT ETL HI-HI   #56  AB#2 LCKOUT
        16-PSH-007B            16-XS-059/207         16-TAHH-203           16-XS-858
 #06  DETONATION         #23  AB EXH CO MALF    #40  CHUT ETL HI-HI   #57  KIL BMP E-STOP
        16-TAHH-008            16-TALL-092/3         16-PSHH-204           16-XS-859
 #07  RET EXH HI HI      #24  AB CHAMB LO-LO    #41  KILN PRESS ALM   #58  AB BMP E-STOP
        16-AISH-011            16-TAHH-092           16-XS-207             24-TSHH-001
 #08  LEL IN DFS RM      #25  AB CHAMB HI-HI    #42  MMS LINE A JAM   #59  QUENCH OVHD AL
        16-XS-019              16-TAHH-099           16-XS-208             24-FAL-002
 #09  EXIT JAM           #26  HDC DRV HI ALM    #43  DFS LINE A JAM   #60  QUENCH BRIN LO
        16-TALL-020            16-IAH-100            16-XS-209             24-FAL-006
 #10  KILN CBR LO-LO     #27  KIL DRV HI ALM    #44  MMS LINE B JAM   #61  BRINE FLOW ALM
        16-TAHH-020            16-LSLL-151           16-XS-210             24-AALL-007
 #11  ROT KILN HI-HI     #28  TRUNNION LOS      #45  DFS LINE B JAM   #62  BRINE PH LO-LO
        16-HS-038              16-ZS-155             16-PSL-214           24-PDALL-008
 #12  KILN DRV MALF      #29  BLDR NOT CLOSE    #46  TRUNNION LOS     #63  VENTURI LO-LO
        16-TAHH-042            16-ZS-156A/C          03-HS-231B           24-LAHH-009
 #13  HDC LHTR HI-HI     #30  BLDR NOT CLAMP    #47  GATE 104 MALF    #64  QUENCH HI-HI
        16-TALL-042            16-ZS-159             16-LSL-350           24-LSLL-024/10
 #14  HDC LHTR LO-LO     #31  BLDR NOT CLOSE    #48  GEARBOX LOS      #65  SCRUB SUMP ALM
        16-HS-044              16-ZS-160A/C/E        16-AAL-781H          24-FAAL-030
 #15  HDC CNVR MALF      #32  BLDR NOT CLAMP    #49  CO2 COMB EFF     #66  CLEAN LQ LO-LO
        16-TAHH-051A           16-AAL-175            16-XS-781            LSHH-32/AH-10
 #16  RETORT HI-HI       #33  AB EXH GAS O2     #50  AB CO2 MALF      #67  SCRUB SUMP ALM
        16-TAHH-051B           16-TALL-182           16-KAL-813           24-DAHH-033
 #17  RETORT HI-HI       #34  KILN EXH LO-LO    #51  RESID TIME ALM   #68  BRINE DENS ALM
```

Figure E-13.   TOCDF Advisor PC Screen DFS Stop Feed Status, Page 1 (DFSF1)

```
            DFS STOP FEED STATUS (DFSF2) PG 2 OF 2          DFSF1
                                                            DFM
        24-AALL-034            24-FSLL-384           24-BLOW-103B         24-ZS-752B
 #01  SL LIQ PH LOLO     #18  OIL 2ND STAGE     #35  2ND STAGE MALF   #52  AIR BLEED OPEN
        24-PALL-036            24-IAH-387                                 DFS-AQS-FDRT
 #02  SL PRESS LO LO     #19  2ND STAGE I HI    #36                   #53  AGENT LBS/HR
        24-XA-065/970          24-IAL-387                                 24-LSLL-562
 #03  NO ID FANS RUN     #20  2ND STAGE I LO    #37  STK ACAMS ALM    #54  ID LUBE LEVEL
        24-TSH-077             24-FSLL-430                               24-PSLL-793
 #04  2ND STAGE MTR      #21  NFPA BURN S/D     #38                   #55  ID LUBE PRESS
        24-XSH-080             24-TSH-448            16-SAHH-602          20-PSLL-016
 #05  2ND STAGE VIB      #22  1ST STAGE BRG     #39  HI KILN RPM      #56  IAS DICO
        16-PDAH-813            24-TSH-449            24-AAL-206           DFS-AQS-FDRT
 #06  REF RING HI DP     #23  2ND STAGE BRG     #40  STACK O2 ALM     #57  AGENT LBS/HR
                               24-TSH-966            16-AHH-175           DFS-RK-FDRT
 #07                     #24  1ST STAGE T HI    #41  DFS PAS O2 HI    #58  RCKT RATE/HR
        PAS702AR               24-IAL-957            16-HS-781A&B         24-TAHH-374
 #08  DUCT ACAMS ALM     #25  1ST STAGE I LO    #42  AB CO2 IN CAL    #59  QNCH TWR HI HI
                               24-IAH-957            HS-059A,-207A        24-TAHHH-374
 #09                     #26  1ST STAGE I HI    #43  EXH CO IN CAL    #60  QNCH  HI HI HI
        16-XS-175/205          24-XSH-968            HS-175A,-206A        DFS-PRO-FDRT
 #10  O2 ANAL MALF       #27  1ST STAGE VIB     #44  EXH O2 IN CAL    #61  PROJO RATE/HR
        24-AAH-206             24-XA-970             24-PALL-011          16-CHNG-BIN
 #11  STACK O2 ALM       #28  1ST STAGE MTR     #45  BR PRESS LOLO    #62  WASTE BIN FULL
                               BRA TANK              03-XA-131            16-ZS-863B
 #12                     #29  LVL HI-HI         #46  GATE 103 MALF    #63  INLET AIR OPEN
        24-AAH-207             16-PDISH-148          24-XY-380A&C
 #13  CO HR AVG ALM      #30  DP @ CYCLONE      #47  BRINE PH MAN     #64
        24-PDAHH-312           16-TAL-092            16-TALL-008
 #14  CANDLE DP HIHI     #31  AB LO ALARM       #48  KILN EXH LO LO   #65
        24-TSHHH-375                                 16-SALL-602
 #15  Q TWR OVHD ALM     #32                    #49  KILN SPED LOLO   #66
        LSLL-381/AL-31         20-PSLL-117           16-SALL-098
 #16  PACKED BED ALM     #33  PLANT AIR LOLO    #50  KILN SPED LOLO   #67
        24-FSLL-383            16-XS-781B            16-SSL-057
 #17  OIL 1ST STAGE      #34  AB CO2 MALF       #51  HDC STOPPED      #68
```

Figure E-14.   TOCDF Advisor PC Screen DFS Stop Feed Status, Page 2 (DFSF2)

```
NOTE: STARRED TAGS ARE      RCRA/TSCA ALARM SUMMARY   (RCE)  DFS   PAGE 4 OF 5
      TSCA DRIVEN    DFS                                           * TSCA TAGS

 #01  16-XS-781      #18  24-AALL-07     #35              #52
      EX GAS CO2 MAL      BRINE PH LOLO
 #02  16-AAL-175     #19  24-AAH-205     #36  16-IAHH-052 #53
      EXH GAS O2 LO       EXH GAS O2 HI       AB EXH HI HI
 #03  16-AAH-055     #20  24-DAHH-33     #37  24-FALL-011 #54
      EXH CO AVG HI       BRINE DNSTY         BRINE PRS LOLO
 #04  16-XS-720      #21  24-PDALL-08    #38  16-SAHH-502 #55
      JAM LINE B          VENTURI DP          HI KILN RPM
 #05  16-XS-720      #22  24-ISHH-01     #39  *16-IAHH-051A #56
      JAM LINE A          QUENCH TEMP         KILN SKIN TEMP
 #06  24-PALL-036    #23  PAS702         #40  *16-IAHH-051B #57
      CLN LIQ PRESS       ACAM DFS            KILN SKIN TEMP
 #07  16-PSHH-204    #24  PAS701         #41  *16-IAHH-051C #58
      RETORT  PRES        ACAM COM STK        KILN SKIN TEMP
 #08  16-TALL-184    #25  24-FALL-30     #42  *16-IAHH-051D #59
      HDC UPPER           CLN LIQ FLO         KILN SKIN TEMP
 #09  16-XS-888      #26  24-FAL-06      #43  *16-IAHH-051E #60
      JAM HDC             BRINE FLOW          KILN SKIN TEMP
 #10  16-XS-881      #27                 #44  16-IALL-008 #61
      JAM HDC                                 KILN EXH LO LO
 #11  16-SSL-057     #28  25-BRA-TNKS    #45  16-SALL-502 #62
      HDC MOTION          BRA TNKS HI         KILN SPED LOLO
 #12  16-PDAH-012    #29  24-FALL-205    #46  DFS-AGS-DRV #63
      EXHST GAS DP        EXH GAS O2 LO       AGENT LBS/HR
 #13  16-TALL-182    #30  16-AAH-175     #47  DFS-RKT-DRV #64
      KILN EXHAUST        EXH GAS O2 HI       RCKT RATE/HR
 #14  16-TALL-08     #31  16-XS-781B     #48  DFS-PRO-DRV #65
      AB TEMP LO LO       EX GAS CO2 MAL      PROJ RATE/HR
 #15  16-TALL-42     #32  *16-AAL-781    #49              #66
      HDC LOWER           COMB EFF LOW
 #16  16-XS-899/207  #33  16-IAHH-008    #50  24-STGR-701 #67
      EX GAS CO MAL       RETORT EX HIHI      STAGGER ACAMS
 #17  16-XS-175/205  #34  24-AAH-207     #51              #68
      EX GAS O2 MAL       EXH CO AVG HI
```

Figure E-15.   TOCDF Advisor PC Screen DFS RCRA Alarm Summary (RCE)

```
                        DFS OVERVIEW (DFO)
        KILN BURNER                              AFTERBURNER

KILN TEMPS        CHUTE TEMPS         BURNER #1            BURNER #2
 TIC-182 XXXXX °F  TIC-150 XXXXX °F    FIRING RATE XXX %    FIRING RATE XXX %
 TIC-020 XXXXX °F  TIC-154 XXXXX °F   FUEL & AIR           FUEL & AIR
KILN PRESSURE     KILN SPEED           FIC-078 XXXXX SCFM   FIC-079 XXXXX SCFM
 PIC-018 XXXXX "WC SIC-098 XXXXX RPM   FIC-191 XXXXX SCFM   FIC-068 XXXXX SCFM
SHROUD AIR        FUEL & AIR          AB TEMP              AB OUTLET
 HIC-016  XXX %    FIC-021 XXXXX SCFM  TIC-092 XXXXX °F     TI-813 XXXXX °F
 HIC-017  XXX %    FIC-243 XXXXX SCFM AB INLET             RESIDENCE TIME
HDC TEMPS         HDC AMPS             TIC-008 XXXXX °F     KI-813 XXXXX SECS
 TIC-184 XXXXX °F  IT-099 XXXXX AMPS  CARBON DIOXIDE       AB PRESSURE
 TIC-042 XXXXX °F  IT-100 XXXXX AMPS   AIT-781A XXXXX %     PIC-65 XXXXX "WC
       KILN FIRING RATE XXX %          AIT-781B XXXXX %

                                DFS PAS

QUENCH FLOW       BRINE PH & SUMP LVL  ID FAN AMPS         DFS STACK CO
 FIC-002 XXXXX GPM AIT-07A XXXXX PH     IT-967  XXXXX AMPS  AIT-059 XXXXX PPM
 LIT-009 XXXXX "WC AIT-07B XXXXX PH     IT-387  XXXXX AMPS  AIT-207 XXXXX PPM
 TIT-374 XXXXX F   LIC-010 XXXXX "WC   TEMP AT ID FAN      DFS STACK O2
VENTURI           CLEAN LIQUOR          TI-9103 XXXXX °F    AIT-175 XXXXX %
 PDIC-008 XXXXX "WC PIT-036 XXXXX PSIG                      AIT-206 XXXXX %
                   FIC-030 XXXXX GPM   TOTAL STACK FLOW
BRINE              LIC-031 XXXXX "WC          FIT-9913
 FIC-006 XXXXX GPM                      DRY = XXXXX SCFM
 PI-011  XXXXX PSIG KURZ METER          WET = XXXXX SCFM
 DIC-033 XXXXX SG   FIT-430 XXXXX SCFM
```

Figure E-16.   TOCDF Advisor PC Screen DFS Overview (DFO)

APPENDIX F

Instrument Ranges

Table F.1 shows the DFS instrument data extracted from the TOCDF Loveland calibration database as of *August 2000*. Not all instrument tag numbers listed are part of the design at ANCDF, PBCDF, and UMCDF[1].

Table F.1   DFS Instrumentation in the TOCDF Loveland Instrument Calibration Database[a]

INSTRUMENT TAG	RCRA	INPUT			OUTPUT			SET POINT	LOOP DEFINITION
		LOW	HI	UNIT	LOW	HI	UNIT		
16-FIT-021	No	0	3.02	in. wc.	4	20	mA		DFS-FURN-101 Combustion Air
16-FIT-066	No	0	20	in. wc.	4	20	mA		DFS-FURN-102 Fuel Gas to Burner 2
16-FIT-078	No	0	2.19	in. wc.	4	20	mA		DFS-FURN-102 Afterburner Comb Air Burner 1
16-FIT-079	No	0	2.19	in. wc.	4	20	mA		DFS-FURN-102 Afterburner Comb Air Burner 2
16-FIT-191	No	0	20	in. wc.	4	20	mA		DFS-FURN-102 Fuel Gas to Burner 1
16-FIT-243	No	0	20	in. wc.	4	20	mA		DFS-FURN-101 Fuel Gas to Burner
16-FSLL-078A[b]	*No*	*0*	*20*	*mA*	*0*	*0*		*4.2*	*DFS-FURN-102 Afterburner Comb Air*
16-FY-078A[b]	*No*	*4*	*20*	*mA*	*4*	*20*	*mA*		*DFS-FURN-102 Afterburner Comb Air Burner 1I/P*
16-HY-016	No	4	20	mA	3	15	Psig		DFS-FURN-101 Shroud Air Inlet I/P
16-HY-017	No	4	20	mA	3	15	Psig		DFS-FURN-101 Shroud Air Inlet I/P
16-HY-863	*No*	*4*	*20*	*mA*	*4*	*20*	*mA*		*DFS-FURN-102 Atmospheric Air Inlet I/P*
16-IT-099	No	0	5	Amp AC	4	20	mA		DFS-CNVX-101 DFS Heated Conveyor Motor Current

---

[1] *DFS instrumentation from site-specific calibration databases at ANCDF, PBCDF, and UMCDF will be included in a future revision of the DFS FAWB.*

Table F.1   (Cont'd)

| INSTRUMENT TAG | RCRA | INPUT | | | OUTPUT | | | SET POINT | LOOP DEFINITION |
		LOW	HI	UNIT	LOW	HI	UNIT		
16-PDISH-148	No	0	5	in. wc.	0	0		2	DFS-SEPA-101 Cyclone
16-PDIT-813	Yes	0	3	in. wc.	4	20	mA		DFS-FURN-102 Afterburner Exhaust Flue Gas Flow
16-PDSH-801	No	5	100	psid	0	0		35	DFS-FURN-101 Trunnion Lube Oil Filters
16-PDSH-802	No	5	100	psid	0	0		35	DFS-FURN-101 Trunnion Lube Oil Filters
16-PDSLL-813[3]	*No*	*4*	*20*	*mA*	*0*	*0*		*4.2*	*DFS-FURN-102 Afterburner Exhaust Flue Gas Flow*
16-PIT-018	Yes	-2	1	in. wc.	4	20	mA		DFS-FURN-101 DFS Furnace
16-PIT-018A	*No*	*-40*	*10*	*in. wc.*	*4*	*20*	*mA*		*DFS-FURN-101 DFS Furnace Pressure (wide range)*
16-PIT-026	No	0	2	psig	4	20	mA		DFS-FURN-101 Fuel Gas to Pilot
16-PIT-065	No	-6	0	in. wc.	4	20	mA		DFS-FURN-102 DFS Afterburner
16-PIT-106	No	0	2	psig	4	20	mA		DFS-BLOW-102 Combustion Air Blower Discharge
16-PIT-168	No	-5	0	in. wc.	4	20	mA		DFS-FURN-101 Exhaust Gas
16-PIT-201	No	0	3	psig	4	20	mA		DFS-FURN-102 Fuel Gas Afterburner
16-PIT-218	No	0	3	psig	4	20	mA		DFS-FURN-101 Fuel Gas Main Burner
16-PIT-229	No	0	2	psig	4	20	mA		DFS-FURN-102 Fuel Gas To Pilot
16-PIT-283	No	0	3	psig	4	20	mA		DFS-BLOW-101 Retort Comb Air Blower Discharge
16-PIT-813	No	11.5	12.5	psia	4	20	mA		DFS-FURN-102 Afterburner Exhaust Flue Gas Flow
16-PSH-007A	No	0.25	5	psig	0	0		0.5	High Order Detonation

Table F.1   (Cont'd)

INSTRUMENT TAG	RCRA	INPUT			OUTPUT			SET POINT	LOOP DEFINITION
		LOW	HI	UNIT	LOW	HI	UNIT		
16-PSH-007B	No	0.25	5	psig	0	0		0.5	High Order Detonation
16-PSHH-025	No	0.5	6	psig	0	0		1.75	DFS-FURN-101 Fuel Gas
16-PSHH-069	No	0.5	6	psig	0	0		2.5	DFS-FURN-102 Fuel Gas to Burner 2
16-PSHH-195	No	0.5	6	psig	0	0		2.5	DFS-FURN-102 Fuel Gas to Burner 1
16-PSHH-204	Yes	-0.2	2	in. wc.	0	0		-0.1	DFS-FURN-101 DFS Retort
16-PSHH-832	No	0	20	in. wc.	0	0		9.7	DFS-FURN-101 Pilot Fuel Gas
16-PSHH-852	No	0.5	6	psi	0	0		2.5	DFS-FURN-102 Pilot Gas
16-PSL-096	No	2	60	psig	0	0		40	DFS-FURN-101 Process Water to DFS Furnace
16-PSL-180	No	0	100	psig	0	0		30	MMS-CHUT-101 Process Water
16-PSL-181	No	0	100	psig	0	0		30	MMS-CHUT-102 Process Water
16-PSL-202	No	0	0.5	in. wc.	0	0		0.1	Kiln Burner Instrument Enclosure
16-PSL-203	No	0	0.5	in. wc.	0	0		0.1	Afterburner Burner Instrument Enclosure
16-PSL-214	No	3	50	psig	0	0		30	DFS-FURN-101 DFS Lube Oil System Supply
16-PSL-349	No	0	6	psig	0	0		3	DFS-FURN-101 DFS Gearbox Lube Oil
16-PSL-863A	*No*	*-15*	*15*	*in. wc.*	*0*	*0*		*-6*	*DFS-FURN-102 Atmospheric Air Inlet*
16-PSL-863B	*No*	*-15*	*15*	*in. wc.*	*0*	*0*		*-6*	*DFS-FURN-102 Atmospheric Air Inlet*
16-PSL-863C	*No*	*-15*	*15*	*in. wc.*	*0*	*0*		*-6*	*DFS-FURN-102 Atmospheric Air Inlet*
16-PSLL-023	No	2.5	45	in. wc.	0	0		10.39	DFS-FURN-101 Fuel Gas Supply

Table F.1   (Cont'd)

INSTRUMENT TAG	RCRA	INPUT			OUTPUT			SET POINT	LOOP DEFINITION
		LOW	HI	UNIT	LOW	HI	UNIT		
16-PSLL-029	No	2.5	45	in. wc.	0	0		20	DFS-FURN-101 Combustion Air
16-PSLL-068	No	2.5	45	in. wc.	0	0		10.39	DFS-FURN-102 Fuel Gas to Burner 2
16-PSLL-194	No	2.5	45	in. wc.	0	0		10.39	DFS-FURN-102 Fuel Gas to Burner 1
16-PSLL-301	No	2.5	45	in. wc.	0	0		5	DFS-FURN-102 Slagging Afterburner Comb Air Burner 1
16-PSLL-302	No	2.5	45	in. wc.	0	0		5	DFS-FURN-102 Slagging Afterburner Comb Air Burner 2
16-PY-018	No	4	20	mA	3	15	psig		DFS-BLOW-103 DFS Exhaust Blower Inlet
16-TISH-004A	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004B	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004C	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004D	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004E	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004F	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004G	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004H	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004I	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp
16-TISH-004J	No	0	1,400	F	0	0		240	DFS-FURN-101 Trunnion Bearing Temp

Table F.1   (Cont'd)

INSTRUMENT TAG	RCRA	INPUT			OUTPUT			SET POINT	LOOP DEFINITION
		LOW	HI	UNIT	LOW	HI	UNIT		
16-TIT-003	Yes	0	2,400	F	4	20	mA		DFS-FURN-102 Flue Gas Inlet Temp
16-TIT-008	Yes	0	2,300	F	4	20	mA		DFS-FURN-101 Retort Exhaust
16-TIT-020	Yes	0	2,000	F	4	20	mA		DFS-FURN-101 Rotary Kiln Temp
16-TIT-042	Yes	0	1,600	°F	4	20	mA		DFS-CNVX-101A-2 DFS Heated Scrap Conveyor
16-TIT-051A	No	0.57	9.18	mV	4	20	mA		DFS-FURN-101 Retort Skin Temperature
16-TIT-051B	No	0.57	9.18	mV	4	20	mA		DFS-FURN-101 Retort Skin Temperature
16-TIT-051C	No	0.57	9.18	mV	4	20	mA		DFS-FURN-101 Retort Skin Temperature
16-TIT-051D	No	0.57	9.18	mV	4	20	mA		DFS-FURN-101 Retort Skin Temperature
16-TIT-051E	No	0.57	9.18	mV	4	20	mA		DFS-FURN-101 Retort Skin Temperature
16-TIT-062	No	0	2,000	F	4	20	mA		DFS-FURN-101 Retort Temperature
16-TIT-092	Yes	0	2,400	F	4	20	mA		DFS-FURN-102 Slagging Afterburner
16-TIT-150	No	0	400	F	4	20	mA		DFS-CHUT-101 RSM/BSR & Mine Discharge Chute A
16-TIT-154	No	0	400	F	4	20	mA		DFS-CHUT-102 RSM/BSR & Mine Discharge Chute B
16-TIT-169	Yes	0	2,300	F	4	20	mA		DFS-FURN-101 Retort Exhaust
16-TIT-182	Yes	0	2,300	F	4	20	mA		DFS-FURN-101 Flue Gases Output Retort
16-TIT-184	Yes	0	1,600	F	4	20	mA		DFS-CNVX-101A-1 DFS Heated Scrap Conveyor
16-TIT-197	No	0	2,600	F	4	20	mA		DFS-FURN-102 Slagging Afterburner
16-TIT-202	No	0	400	F	4	20	mA		DFS-CHUT-101 RSM/BSR & Mine Discharge Chute A

Table F.1   (Cont'd)

INSTRUMENT TAG	RCRA	INPUT			OUTPUT			SET POINT	LOOP DEFINITION
		LOW	HI	UNIT	LOW	HI	UNIT		
16-TIT-203	No	0	400	F	4	20	mA		DFS-CHUT-102 RSM/BSR & Mine Discharge Chute B
16-TIT-244	Yes	0	2,300	F	4	20	mA		DFS-FURN-101 Flue Gas to Cyclone
16-TIT-369	No	0	2,300	F	4	20	mA		DFS-FURN-101 Retort Drive
16-TIT-813	No	0	2,400	F	4	20	mA		DFS-FURN-102 Afterburner Exhaust
16-TIT-822	No	0	150	F	4	20	mA		DFS-BLOW-102 Comb Air Discharge
16-TIT-833	No	0	250	F	4	20	mA		DFS-BLOW-101 Combustion Air to DFS-FURN-101
16-TSH-197	No	4	20	mA	0	0		13.231	DFS-FURN-102 Afterburner Chamber
16-TSL-197	No	4	20	mA	0	0		12.615	DFS-FURN-102 Afterburner Chamber Purge Bypass
16-TSH-151	No	40	225	°F	0	0		150	DFS-FURN-101 Lube Oil Supply to Trunnion Bearings
16-TSH-345	No	0	1,400	°F	0	0		180	DFS-FURN-101 DFS Gearbox Lube Oil
16-TSHH-062	No	4	20	mA	18	0		18	DFS-FURN-101 Kiln Temperature
16-TSHH-197	No	4	20	mA	0	0		18.77	DFS-FURN-102 Afterburner Extreme Temp.
16-TSL-062	No	4	20	mA	0	0		15.2	DFS-FURN-101 Kiln Temperature
16-TSLL-062	No	4	20	mA	0	0		11.2	DFS-FURN-101 Kiln Temperature
16-TY-150	No	4	20	mA	3	15	psig		DFS-CHUT-101 RSM/BSR & Mine Discharge Chute A
16-TY-154	No	4	20	mA	3	15	psig		DFS-CHUT-102 RSM/BSR & Mine Gate I/P

[a] *The following instruments were deleted from the table because they are no longer in the database, however, they are still shown on the P&ID: 16-FY-066, 16-FY-078, 16-FY-079, and 16-FY-191.*
[b] *16-FSLL-078A, 16-FSLL-078A, and 16-PDSLL-813 were added as interim devices (see FAWB Note B-25)*

APPENDIX G

Intercontroller Communications

DFS operations are or will be controlled by the same PLC, ICS-CONR-112, at all four sites. Table G.1 lists the digital intercontroller inputs and outputs (DICIs/DICOs) for ICS-CONR-112 *at ANCDF and TOCDF*. The DICIs/DICOs listed are based on the *April 2001* TOCDF code *and the April 2001 ANCDF code.* The *ANCDF and* TOCDF code*s were* used since site-specific code currently exists for *these sites* only. *DICIs/DICOs apply to both ANCDF and TOCDF unless otherwise noted in the description.*

NOTE: Table G.1 includes DICIs/DICOs extracted directly from the ANCDF code. A number of changes are expected, however, based on the ANCDF site-specific configuration. These include:

- *DICIs/DICOs associated with ICS-CONR-119 are listed. Since ANCDF will not have ICS-CONR-119, these DICIs/DICOs will be deleted.*
- *Descriptions for ICS-CONR-114 DICIs/DICOs have tag numbers associated with LIC #1 at TOCDF and UMCDF. These descriptions will be revised to reflect the ANCDF tag numbers.*
- *Descriptions for DICIs/DICOs associated with ACAMS have TOCDF identifiers (e.g. PAS702). Where applicable, these TOCDF identifiers will be replaced with the ANCDF tag numbers.*

Table G.1 *ANCDF and* TOCDF DFS *ICS-CONR-112* DICIs and DICOs

To Controller			From Controller				Interpretation			
CONR	Input Word (B4:)	Safe Mask (B4:)	CONR	Output Word	Bit	Description	0	1	Safe
101A	031	131	112	051	00	DFS Furnace Normal		Normal	0
101A	031	131	112	051	02	MMS-GATE-103		Open	0
101A	031	131	112	051	03	*AN -* DFS Rockets/hr Pre-alarm *TE – Projos/hr I-lock*		*AN:* Alarm *TE: I-lock*	0
101A	031	131	112	051	04	Line A Agent lb/hr Limit Pre-alarm		Alarm	0
101A	*031*	*131*	*112*	*051*	*05*	*(TE only) Agent Accepted by DFS*		*Accepted*	*0*
101A	*031*	*131*	*112*	*051*	*07*	*(TE only) PMD Idle Gate Spray*		*Activated*	*0*
101B	*031*	*131*	*112*	*053*	*00*	*DFS Furnace Normal*		*Normal*	*0*
101B	*031*	*131*	*112*	*053*	*02*	*(TE only) Coprocessing Rkts and Projos Start*		*Start*	*0*
101B	*031*	*131*	*112*	*053*	*03*	*(TE only) Coprocessing Rkts and Projos Stop*		*Stop*	*0*
101B	*031*	*131*	*112*	*053*	*04*	*(TE only) Rkts /hr Count Equals 0.*		*Equals zero*	*0*
104A	031	131	112	063	00	DFS Furnace Normal		Normal	0
104A	031	131	112	063	02	MMS-GATE-104		Open	0
104A	031	131	112	063	03	DFS Rockets/hr Pre-alarm*/I-lock*		Alarm	0
104A	031	131	112	063	04	Line B Agent lb/hr Limit Pre-alarm		Alarm	0
104A	*031*	*131*	*112*	*063*	*05*	*(TE only) Agent Accepted by DFS*		*Accepted*	*0*
104A	*031*	*131*	*112*	*063*	*06*	*(TE only) Gelled Rocket Empty Furnace (agent in DFS equals zero).*		*Equals zero*	*0*
104A	*031*	*131*	*112*	*063*	*07*	*(TE only) Agent Heel Rec'd at DFS*		*Received*	*0*
104A	*031*	*131*	*112*	*063*	*10*	*(TE only) Coprocessing Rkts and Projos Start*		*Start*	*0*
104A	*031*	*131*	*112*	*063*	*11*	*(TE only) Coprocessing Rkts and Projos Stop*		*Stop*	*0*
104A	*031*	*131*	*112*	*063*	*12*	*(TE only) Projos /hr Count Equals 0.*		*Equals zero*	*0*
104B	*031*	*131*	*112*	*065*	*00*	*(AN only) DFS Furnace Normal*		*Normal*	*tbd[a]*
105	031	131	112	067	00	16-PSH-007A/B DFS-FURN-101 Detonation Not Detected	Explosion	Normal	0
106	031	131	112	069	00	CAT "B" Sump Running	Stopped	Running	0

Table G.1   (Cont'd)

To Controller			From Controller				Interpretation		
CONR	Input Word (B4:)	Safe Mask (B4:)	CONR	Output Word	Bit	Description	0	1	Safe
106	031	131	112	069	01	CAT "C" Sump Running	Stopped	Running	0
106	031	131	112	069	02	*(TE only)* SDS-PUMP-161 06-LSL-036 Active for 12 Hours		Active for 12 hours	0
106	031	131	112	069	03	*(TE only)* SDS-PUMP-161 06-LSL-036 Active for 18 Hours		Active for 18 hours	0
109	031	131	112	075	00	*(TE only)* PAS-BLOW-103A 1st Stage Running		Running	0
109	031	131	112	075	01	PAS-BLOW-103A 1st Stage Not Running		Not Running	0
109	031	131	112	075	02	*(TE only)* PAS-BLOW-103B 2nd Stage Running		Running	0
109	031	131	112	075	03	PAS-BLOW-103B 2nd Stage Not Running		Not Running	0
110	031	131	112	077	15	Received Campaign Select Data		Received	0
110	031	131	112	077	16	Request Campaign Select Update		Request	0
110	032	132	112	078	00	Screen D12 Diagnostic Adv Alarm		Alarm	0
110	032	132	112	078	01	Screen D12 Diagnostic Adv Unacknowledge		Unack.	0
111	031	131	112	079	00	PAS PUMP-110 HI HI Level Alarm	No alarm	HI HI Alarm	0
112	001	101	101A	081	00	Rocket Fuze or Tail Pieces on DFS Feed Gate	No	Yes	1
112	001	101	101A	081	01	Rocket Burster Pieces on DFS Gate	No	Yes	0
112	001	101	101A	081	02	Rocket Motor Pieces on DFS Gate	No	Yes	0
112	001	101	101A	081	03	*(TE only)* RHS-RSM-101 Discharge Chute Fire	No	Yes	0
112	001	101	101A	081	04	RSM Station Feed to DFS Watch Dog Timed Out	OK	Malf.	0
112	001	101	101A	081	05	Manual Burster Drop Required	No	Yes	0
112	001	101	101A	081	06	Solid Waste Dropped into DFS	No	Yes	0

Table G.1   (Cont'd)

To Controller			From Controller				Interpretation		
CONR	Input Word (B4:)	Safe Mask (B4:)	CONR	Output Word	Bit	Description	0	1	Safe
112	001	101	101A	081	10	Fuze Positioned at RSM	No	Yes	0
112	*001*	*101*	*101A*	*081*	*11*	*(TE only) Munition Selection Projectiles*		*Projos Selected*	*0*
112	*001*	*101*	*101A*	*081*	*12*	*(TE only) BSR Received Burster*		*Got it*	*0*
112	013	113	104A	081	00	Rocket Fuze or Tail Pieces on DFS Feed Gate	No	Yes	0
112	013	113	104A	081	01	Rocket Burster Pieces on DFS Gate	No	Yes	1
112	013	113	104A	081	02	Rocket Motor Pieces on DFS Gate	No	Yes	0
112	013	113	104A	081	03	RHS-RSM-101 Discharge Chute Fire	No	Yes	0
112	013	113	104A	081	04	RSM Station Feed to DFS Watch Dog Timed Out	OK	Malf.	0
112	013	113	104A	081	05	Manual Burster Drop Required	No	Yes	0
112	013	113	104A	081	06	Solid Waste Dropped into DFS	No	Yes	1
112	013	113	104A	081	10	Fuze Positioned at RSM	No	Yes	0
112	*013*	*113*	*104A*	*081*	*13*	*(TE only) RSM at Cut Position 8*	*No*	*Yes*	*0*
112	*013*	*113*	*104A*	*081*	*14*	*(TE only) Rocket Tail Piece on Feed Gate*	*No*	*Yes*	*0*
112	017	117	105	081	00	Plant Air Available (Sumps)		Available	0
112	017	117	105	081	01	Instrument Air Available (Blast Valves		Available	0
112	019	119	106	081	00	Sump Pump Enable	Enabled	Inhibited	0
112	023	123	108	081	01	Selected BRA Tank Not Hi-Hi		Available	0
112	023	123	108	081	02	Medical ACAMS Not Online Timer	OK	Alarm	0
112	025	125	109	081	00	Elec. System OK		Normal	0
112	025	125	109	081	01	Elec. System Power Loss		Power Lost	0
112	025	125	109	081	02	Start Essential Power Equip.		Start	0
112	027	127	110	081	00	HVAC ACAMS Not Online Timer	OK	Alarm	0
112	029	129	111	081	00	DUN ACAMS Not Online Timer	OK	Alarm	0
112	033	133	113	081	00	24-HS-293 PAS-DMIS-103 MPF Controls Spare Demis		MPF Using Spare	0

Table G.1   (Cont'd)

To Controller			From Controller				Interpretation		
CONR	Input Word (B4:)	Safe Mask (B4:)	CONR	Output Word	Bit	Description	0	1	Safe
112	033	133	113	081	01	24-LSLL-061 PAS-DMIS-105	OK	Alarm	0
112	033	133	113	081	02	PAS703 Duct from MPF to PAS Not Online	OK	Alarm	0
112	033	133	113	081	03	PAS702B Duct from DFS to PAS Operating		Normal	0
112	033	133	113	081	04	*(TE only)* PAS702B Duct from DFS to PAS ACAMS Alarm		Alarm	0
112	033	133	113	081	05	*(TE only)* PAS702 = PAS703B		Activated	0
112	033	133	113	081	06	*(TE only)* PAS702 = PAS703B Chal/Serv/Rep		Offline	0
112	*034*	*134*	*113*	*082*	*02*	*(AN only) XV-094/095A FILT-113 Access Dampers*		*Open*	*0*
112	*034*	*134*	*113*	*082*	*03*	*(AN only) XV-094/095B FILT-113 Access Dampers*		*Closed*	*0*
112	*034*	*134*	*113*	*082*	*04*	*(AN only) XV-438/439A FILT-110 In/Out Dampers*		*Open*	*0*
112	*034*	*134*	*113*	*082*	*05*	*(AN only) XV-438/439B FILT-110 In/Out Dampers*		*Closed*	*0*
112	*034*	*134*	*113*	*082*	*06*	*(AN only) XV-487/488A FILT-113 In/Out Dampers*		*Open*	*0*
112	*034*	*134*	*113*	*082*	*07*	*(AN only) XV-487/488B FILT-113 In/Out Dampers*		*Closed*	*0*
112	*034*	*134*	*113*	*082*	*11*	*(AN only) XV-131/132B PAS /ID Fan Access Dampers*		*Closed*	*0*
112	035	135	114	081	00	PAS-704 Not Online Timer	OK	Alarm	0
112	035	135	114	081	01	PAS-704B&C ACAMS Active	Normal	Trial Burn	0
112	*036*	*136*	*114*	*082*	*02*	*(AN only) XV-515/516A FILT-113 Access Damper*		*Open*	*0*
112	*036*	*136*	*114*	*082*	*03*	*(AN only) XV-515/516B FILT-113 Access Damper*		*Closed*	*0*
112	*036*	*136*	*114*	*082*	*04*	*(AN only) XV-454/455A FILT-109 In/Out Damper*		*Open*	*0*

Table G.1   (Cont'd)

| To Controller | | | From Controller | | | | Interpretation | | |
CONR	Input Word (B4:)	Safe Mask (B4:)	CONR	Output Word	Bit	Description	0	1	Safe
112	*036*	*136*	*114*	*082*	*05*	*(AN only) XV-454/455B FILT-109 In/Out Damper*		*Closed*	*0*
112	*036*	*136*	*114*	*082*	*07*	*(AN only) XV-583/584B PAS ID Fan Access Damper*		*Closed*	*0*
112	041	141	119	081	00	PAS-705 Not Online Timer	OK	Alarm	1
112	041	141	119	081	01	PAS-702C Operating Normal	Offline	Normal	0
112	041	141	119	081	02	*(TE only)* PAS-702C ACAMS Alarm	Normal	Alarm	0
112	041	141	119	081	03	*(TE only)* PAS 702=703	Normal	Activate	0
112	041	141	119	081	04	*(TE only)* PAS-705 Chal/Serv/Rep		Offline	0
112	*042*	*142*	*119*	*082*	*02*	*(AN only) XV-415/416A FILT-113 Access Damper*		*Open*	*0*
112	*042*	*142*	*119*	*082*	*03*	*(AN only) XV-415/416B FILT-113 Access Damper*		*Closed*	*0*
112	*042*	*142*	*119*	*082*	*04*	*(AN only) XV-436/437A FILT-209 In/Out Damper*		*Open*	*0*
112	*042*	*142*	*119*	*082*	*05*	*(AN only) XV-436/437B FILT-209 In/Out Damper*		*Closed*	*0*
112	*042*	*142*	*119*	*082*	*07*	*(AN only) XV-410/409B PAS ID Fan Access Damper*		*Closed*	*0*
113	031	131	112	083	00	PAS 701 Common Furnace PAS Stack ACAMS Stop Feed	No Alarm	Alarm	0
113	031	131	112	083	01	PAS 701 PAS-STACK-101 Common Stack Agent Alarm	No Alarm	Alarm	0
113	031	131	112	083	03	24-HS-314 PAS-DMIS-104 DFS Controls Spare Demister		DFS Has Spare	0
113	031	131	112	083	04	PAS 702B Duct from DFS to PAS		Activated	0
113	031	131	112	083	05	*(TE only)* PAS 702=PAS 703 Activate		Activated	0
113	031	131	112	083	06	*(TE only)* PAS 702=PAS 703 Operating		Normal	0
113	031	131	112	083	07	*(TE only)* PAS 702=PAS 703 ACAMS Alarm		Alarm	0

Table G.1   (Cont'd)

To Controller			From Controller				Interpretation		
CONR	Input Word (B4:)	Safe Mask (B4:)	CONR	Output Word	Bit	Description	0	1	Safe
113	031	131	112	083	10	*(TE only)* PAS 702=PAS 703B Operating		Normal	0
113	031	131	112	083	11	*(TE only)* PAS 702=PAS 703B ACAMS Alarm		Alarm	0
113	031	131	112	083	12	*(TE only)* ACAMS PAS702 = PAS703B Chal/Serv/Rep		Offline	0
113	*032*	*132*	*112*	*084*	*00*	*(AN only) XV-449A Bypass Damper*		*Open*	*0*
113	*032*	*132*	*112*	*084*	*01*	*(AN only) XV-449B Bypass Damper*		*Closed*	*0*
113	*032*	*132*	*112*	*084*	*02*	*(AN only) XV-440/441A FILT-111 In/Out Dampers*		*Open*	*0*
113	*032*	*132*	*112*	*084*	*03*	*(AN only) XV-440/441B FILT-111 In/Out Dampers*		*Closed*	*0*
113	*032*	*132*	*112*	*084*	*04*	*(AN only) XV-442/443A FILT-112 In/Out Dampers*		*Open*	*0*
113	*032*	*132*	*112*	*084*	*05*	*(AN only) XV-442/443B FILT-112 In/Out Dampers*		*Closed*	*0*
113	*032*	*132*	*112*	*084*	*06*	*(AN only) XV-413/414A FILT-113 Access Dampers*		*Open*	*0*
113	*032*	*132*	*112*	*084*	*07*	*(AN only) XV-413/414B FILT-113 Access Dampers*		*Closed*	*0*
113	*032*	*132*	*112*	*084*	*10*	*(AN only) Request for FILT-113*		*Request*	*0*
113	*032*	*132*	*112*	*084*	*11*	*(AN only) Request for FILT-110*		*Request*	*0*
113	*032*	*132*	*112*	*084*	*12*	*(AN only) Request for FILT-109*		*Request*	*0*
113	*032*	*132*	*112*	*084*	*13*	*(AN only) Request for FILT-209*		*Request*	*0*
114	031	131	112	085	00	PAS 701 Common Furnace PAS Stack ACAMS Stop Feed		Alarm	0
114	031	131	112	085	01	PAS 701 PAS-STACK-101 Common Stack Agent Alarm		Alarm	0
114	*032*	*132*	*112*	*086*	*00*	*(AN only) XV-449A Bypass Damper*		*Open*	*0*
114	*032*	*132*	*112*	*086*	*01*	*(AN only) XV-449B Bypass Damper*		*Closed*	*0*

Table G.1   (Cont'd)

To Controller			From Controller				Interpretation		
CONR	Input Word (B4:)	Safe Mask (B4:)	CONR	Output Word	Bit	Description	0	1	Safe
114	*032*	*132*	*112*	*086*	*02*	*(AN only) XV-440/441A FILT-111 In/Out Damper*		*Open*	*0*
114	*032*	*132*	*112*	*086*	*03*	*(AN only) XV-440/441B FILT-111 In/Out Damper*		*Closed*	*0*
114	*032*	*132*	*112*	*086*	*04*	*(AN only) XV-442/443A FILT-112 In/Out Damper*		*Open*	*0*
114	*032*	*132*	*112*	*086*	*05*	*(AN only) XV-442/443B FILT-112 In/Out Damper*		*Closed*	*0*
114	*032*	*132*	*112*	*086*	*06*	*(AN only) XV-413/414A FILT-113 Access Damper*		*Open*	*0*
114	*032*	*132*	*112*	*086*	*07*	*(AN only) XV-413/414B FILT-113 Access Damper*		*Closed*	*0*
114	*032*	*132*	*112*	*086*	*10*	*(AN only) Request for FILT-113*		*Request*	*0*
114	*032*	*132*	*112*	*086*	*11*	*(AN only) Request for FILT-110*		*Request*	*0*
114	*032*	*132*	*112*	*086*	*12*	*(AN only) Request for FILT-109*		*Request*	*0*
114	*032*	*132*	*112*	*086*	*13*	*(AN only) Request for FILT-209*		*Request*	*0*
119	031	131	112	091	00	PAS 701 Common Furnace PAS Stack ACAMS Stop Feed		Alarm	0
119	031	131	112	091	01	PAS 701 PAS-STACK-101 Common Stack Agent Alarm		Alarm	0
119	031	131	112	091	03	PAS 702C Duct from DFS to PAS		Activated	0
119	*032*	*132*	*112*	*092*	*00*	*(AN only) XV-449A Bypass Damper*		*Open*	*0*
119	*032*	*132*	*112*	*092*	*01*	*(AN only) XV-449B Bypass Damper*		*Closed*	*0*
119	*032*	*132*	*112*	*092*	*02*	*(AN only) XV-440/441A FILT-111 In/Out Damper*		*Open*	*0*
119	*032*	*132*	*112*	*092*	*03*	*(AN only) XV-440/441B FILT-111 In/Out Damper*		*Closed*	*0*
119	*032*	*132*	*112*	*092*	*04*	*(AN only) XV-442/443A FILT-112 In/Out Damper*		*Open*	*0*
119	*032*	*132*	*112*	*092*	*05*	*(AN only) XV-442/443B FILT-112 In/Out Damper*		*Closed*	*0*
119	*032*	*132*	*112*	*092*	*06*	*(AN only) XV-413/414A FILT-113 Access Damper*		*Open*	*0*
119	*032*	*132*	*112*	*092*	*07*	*(AN only) XV-413/414B FILT-113 Access Damper*		*Closed*	*0*

Table G.1   (Cont'd)

To Controller			From Controller				Interpretation		
CONR	Input Word (B4:)	Safe Mask (B4:)	CONR	Output Word	Bit	Description	0	1	Safe
119	032	132	112	092	10	(AN only) Request for FILT-113		Request	0
119	032	132	112	092	11	(AN only) Request for FILT-110		Request	0
119	032	132	112	092	12	(AN only) Request for FILT-109		Request	0
119	032	132	112	092	13	(AN only) Request for FILT-209		Request	0

[a] *Safe mask value to be determined. Code was not available when this revision was prepared.*

APPENDIX H

References

PROGRAMMATIC

CSDP Control Systems Software Design Guide, Revision 19, 3-12-93.

Programmatic Process FAWB Maintenance Plan, Revision 0, 12-8-98.

ANCDF (through Change Case *AN-06-18-0172R1*)

ANCDF System Hazard Analysis, November 1997.

ANCDF Installation, Operation and Maintenance Manual, Heated Discharge Conveyor (DFS-CNVX-101), Allis Mineral Systems, October 1995.

ANCDF Mass & Energy Balances, Rev.6, August 1998, transmitted by PC-14885, September 11, 1998.

ANCDF Control System Source Code, April 2001.

Memorandum from ANCDF Site Project Manager to Operations Division, PMA-01-0050, Programmatic Review of Deactivation Furnace System (DFS) and Metal Parts Furnace (MPF) System, 9 March 2001.

ANCDF MPF and DFS Meeting Trip Report, Transmittal # PC-17861, Parsons Infrastructure & Technology Group, Inc., 13 March 2001.

AN-1-D-501, Rev. 6, 10-2-98	*Rocket Processing System (A) P&ID*
AN-1-D-502, Rev. 6, 10-2-98	*Rocket Processing System (B) P&ID*
AN-1-D-531/1, *Rev. 8, 1-12-01*	DFS Retort P&ID
AN-1-D-531/2, Rev. 3, 10-2-98	DFS Heated Scrap Discharge Conveyor P&ID
AN-1-D-533, Rev. 3, 10-2-98	DFS Air Blower/Retort Lube Oil System P&ID
AN-6-D-509, *Rev. 6, 1-12-01*	DFS Afterburner P&ID
AN-1-E-73/1, *Rev. 2, 8-20-99*	MDB Electrical, Panel Schedules
AN-1-E-906, Rev. 3, 8-28-98	SPS-MCC-102 480V MCC-Essential No.2 Single Line Diagram
AN-1-E-912, Rev. 2, 5-8-98	SPS-MCC-108 480V MCC-DFS Single Line Diagram
AN-6-E-501, *Rev. 7, 11-5-99*	SPS-MCC-111 480V MCC-PAS No.1 Single Line Diagram

ANCDF (cont'd)

AN-1-F-501, Rev. 4, 3-27-98   DFS Process Flow Diagram
AN-6-H-504, Rev. 2, 10-2-98   DFS Cyclone Enclosure Filter HVAC Exhaust
                                    Control Diagram

PBCDF (through Change Case *PB-07-98-131, including Fast Tracks 1 thru 7*)

PBCDF System Hazard Analysis, November 1996.

PBCDF Process Design Analysis without calculations, Construction Rev.2.

PBCDF Process Design Basis without calculations, Construction Rev.2.

PBCDF Mass & Energy Balances, transmitted by PC-9109, September 2, 1994 (Replacement pages; original transmitted by PC-8988, July 24, 1994)

PB-1-D-501, Rev.3, 1-24-01   *Rocket Processing System (A) P&ID*
PB-1-D-502, Rev.3, 1-24-01   *Rocket Processing System (B) P&ID*
PB-1-D-532, *Rev.4, 1-24-01*   DFS Retort P&ID
PB-1-D-533, *Rev.2, 2-25-00*   DFS Air Blower/Retort Lube Oil System P&ID
PB-1-D-537, *Rev.3, 1-24-01*   DFS Heated Scrap Discharge Conveyor P&ID
PB-6-D-509, *Rev.6, 5-10-01*   DFS Afterburner P&ID
PB-1-E-654, *Rev.4, 5-10-01*   MDB Electrical, Panel Schedules
PB-1-E-907, *Rev.4, 5-10-01*   SPS-MCC-102 480V MCC-Essential No.2 Single
                                    Line Diagram
PB-1-E-910, *Rev.4, 2-26-01*   SPS-MCC-105 480V MCC-MPF/BDS/DFS Single
                                    Line Diagram
PB-6-E-501, *Rev.4, 1-24-01*   SPS-MCC-111 480V MCC-PAS No.1 Single Line
                                    Diagram
PB-1-F-501, Rev. 3, 1-29-99   DFS Process Flow Diagram
PB-6-H-504, Rev. 2, 7-10-98   DFS Cyclone Filter HVAC Exhaust Control Diagram

TOCDF

TOCDF Functional Analysis Workbook, Section III, Chapter 5.5, Deactivation Furnace System (DFS), *Rev.2, Change 5, October 5, 2000.*

TOCDF Control System Source Code, *April, 2001.*

TOCDF Loveland Instrument Calibration Database, *August 2000.*

TOCDF Standing Operating Procedure, DFS Furnace System Startup, Operation and Shutdown, TE-SOP-004, *Rev.6, Change 0, 3-26-01.*

TOCDF (cont'd)

TOCDF System Hazard Analysis for Treaty Compliance, Deactivation Furnace System, May 1995.

TOCDF Mass & Energy Balances, November 1990.

Assessment of CSDP Munitions Tracking Capability, MTR 940000106, September 1995.

TE-1-D-501, Rev. 25, 5-20-99	*Rocket Processing System (A) P&ID*
TE-1-D-502, Rev. 23, 3-14-01	*Rocket Processing System (B) P&ID*
TE-1-D-531/1, *Rev. 23, 4-19-01*	DFS Retort P&ID
TE-1-D-531/2, Rev. 17, 9-3-98	DFS Heated Discharge Conveyor P&ID
TE-1-D-533, Rev. 15, 3-6-98	DFS Air Blower/Retort Lube Oil System P&ID
TE-1-D-552, Rev. 15, 4-6-98	*Rocket Shear Machine (A) P&ID*
TE-1-D-554, Rev. 15, 4-6-98	*Rocket Shear Machine (B) P&ID*
TE-6-D-509, Rev. 20, 3-15-01	DFS Afterburner P&ID
TE-1-E-72/1, *Rev. 28, 12-22-00*	MDB Electrical, Panel Schedules
TE-1-E-73/1, *Rev. 23, 12-22-00*	MDB Electrical, Panel Schedules
TE-1-E-906, *Rev. 20, 8-4-99*	SPS-MCC-102 480V MCC-Essential No.2 Single Line Diagram
TE-1-E-912, *Rev. 17, 12-14-00*	SPS-MCC-108 480V MCC-DFS Single Line Diagram
TE-6-E-501, *Rev. 17, 7-28-00*	SPS-MCC-111 480V MCC-PAS No.1 Single Line Diagram
TE-1-F-501, Rev. 10, 9-5-96	DFS Process Flow Diagram
42-408-646, *EG&G Rev. 18*	Afterburner Burner No.2 Control System Schematic Diagram
42-408-648, *EG&G Rev. 16*	Kiln Burner System Schematic Diagram Control Panel
42-408-669, *EG&G Rev. 12*	Afterburner Burner No.1 Control System Schematic Diagram

UMCDF (through *Cost Plus* Change Case *0145*)

UMCDF Process Design Basis, *July 1999, Rev.6, transmitted by PC-15860, July 1, 1999.*

UMCDF Process Design Analysis without calculations, *Rev.5, Aug 1998, transmitted by PC-14812, August 28, 1998.*

UMCDF Facility Design Analysis without calculations, *Rev.6, Aug 1998, transmitted by PC-14812, August 28, 1998.*

UMCDF Mass & Energy Balances, transmitted by PC-15946, July 23, 1999.

UM-1-D-501, Rev. 5, 9-11-00   *Rocket Processing System (A) P&ID*

UMCDF (cont'd)

UM-1-D-502, Rev. 5, 9-11-00	*Rocket Processing System (B) P&ID*
UM-1-D-531/1, *Rev. 6, 5-18-01*	DFS Retort P&ID
UM-1-D-531/2, *Rev. 3, 9-11-00*	DFS Heated Scrap Discharge Conveyor P&ID
UM-1-D-533, *Rev. 3, 9-11-00*	DFS Air Blower/Retort Lube Oil System P&ID
UM-6-D-509, *Rev. 7, 5-18-01*	DFS Afterburner P&ID
UM-1-E-73/1, *Rev.4, 8-28-00*	MDB Electrical, Panel Schedules
UM-1-E-906, Rev. 2, 1-9-98	SPS-MCC-102 480V MCC-Essential No.2 Single Line Diagram
UM-1-E-912, *Rev. 3, 8-28-00*	SPS-MCC-108 480V MCC-DFS Single Line Diagram
UM-6-E-501, Rev. 2, 6-5-98	SPS-MCC-111 480V MCC-PAS No.1 Single Line Diagram
UM-1-F-501, *Rev. 6, 5-18-01*	DFS Process Flow Diagram
UM-6-H-504, *Rev. 3, 9-11-00*	DFS Cyclone Enclosure Filter HVAC Exhaust Control Diagram